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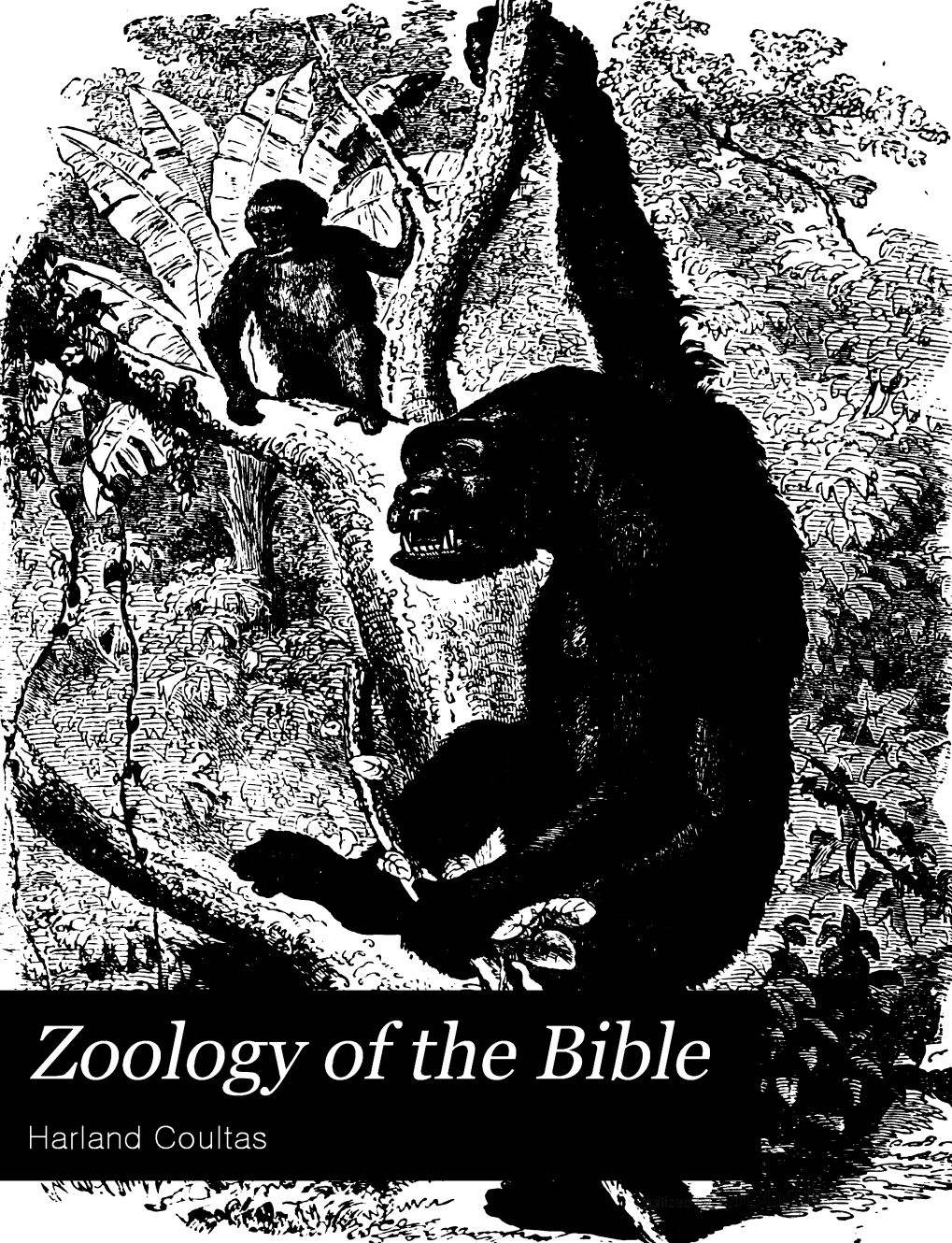
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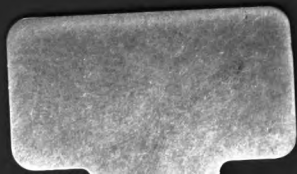
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Zoology of the Bible

Harland Coultas



ZOOLOGY OF THE BIBLE.

ZOOLOGY OF THE BIBLE.

BY

HARLAND COULTAS,

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P R E F A C E.



IF we contemplate the immense quantity of animals which occupy the earth, the air, and the waters of our globe, we are at first struck with the variety of forms under which they present themselves, with their colours so diversified, and sometimes so brilliant, and with the colossal proportions of some as compared with the diminutiveness of others. But when, after this superficial examination, we study them more attentively, when we examine with care the structure of each being, we at once see the perfection that exists in its organs, and how well they are adapted to its peculiar habits and mode of life : from the bird which flies on feathered pinions through the air, to the insect on which it feeds, and which shares with it the same element ; from those gigantic and powerful herbivora, the hippopotamus and elephant, crashing through the undergrowth of the swamp and forest, to the light and active deer and antelope on which the lion and tiger prey ; from the enormous whale which requires an ocean to swim in, to those minute and myriad forms of animalcule which find ample room for all their evolutions in a single drop of its waters,—all form a collection of objects whose framework is constructed in the most admirable manner, and whose vital manifestations are in the highest degree instructive and interesting.

The student is thus led to the conception of an infinite power

and intelligence which he sees everywhere visible in the order and system which pervades the living creation. Nothing then can be more unfounded than the objection that science is opposed to religion, and "that it fosters in its cultivators an undue and overweening self-conceit, leading them to doubt the immortality of the soul, and to scoff at revealed religion. Its natural effect, we may confidently assert, on every well-constituted mind is and must be the direct contrary. No doubt, the testimony of natural reason must of necessity stop short of those truths which it is the object of revelation to make known ; but while it places the existence and principal attributes of a Deity on such grounds as to render doubt impossible, it unquestionably opposes no natural or necessary obstacle to further progress ; on the contrary, by cherishing as a vital principle an unbounded spirit of enquiry, it unfetters the mind from prejudices of every kind, guarding it not only against enthusiasm and self-deception, by a habit of strict investigation, but encouraging, rather than suppressing, everything that can offer a prospect or a hope beyond the present obscure and unsatisfactory state."* To the views thus reverently and admirably put by an eminent Christian philosopher it is only necessary to add a few words from the Scriptures, and the position claimed for science in this volume will be, we hope, clearly understood. Rom. i. 20 : "For the invisible things of Him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead." Ps. xix. 1 : "The heavens declare the glory of God, and the firmament sheweth His handiwork. Day unto day uttereth speech, and night unto night sheweth knowledge. There is no speech nor language where their voice is not heard." Ps. xiv. 1 : "The fool hath said in his heart, There is no God."

* "Preliminary Discourse on the Study of Natural Philosophy," by Sir John F. W. Herschel, Bart., F.R.S., etc.

In tracing out scientifically the plan of nature—for true science is never denounced in the Scriptures, but only (1 Tim. vi. 20) “science falsely so called”—and ascertaining the true position assigned to each animal, we soon find that all animals have been arranged on certain leading or primary types of structure, of which all their varied forms are but modifications, as if the Creator had imposed on Himself from the beginning certain fixed rules from which He would not swerve. The method of arrangement here adopted, and which is most favoured by naturalists, is, with some slight modifications, very nearly that of Cuvier.

The application of this modern system of zoological classification to the zoology of the Bible, to minds unused to scientific enquiry, would seem at first to be utterly impracticable. “We do not here allude,” says Sir John Herschel, “to such reasoners as would make all nature bend to their narrow interpretations of obscure and difficult passages in the sacred writings; such a course might well become the persecutors of Galileo, and the other bigots of the fifteenth and sixteenth centuries, but can only be adopted by dreamers in the present age. To persons of such a frame of mind it ought to suffice to remark that truth can never be opposed to truth;” * in other words, it is impossible that the works and the word of God should come into collision. Hence the importance of carefully studying the Scriptures so as to arrive at accurate and enlightened views as to their true meaning, and studying them not so much in the language of the authorized version, as in the Hebrew and Greek languages in which they were originally written; for in this way only may we hope confidently to realize their beautiful and impressive truths and their perfect harmony with God’s revelation of Himself in nature. In this spirit all difficulties are, it is hoped, met in this volume; candid admissions are made of well-established scientific facts,

* “Discourse on the Study of Natural Philosophy.”

and only such interpretations of their meanings have been introduced, admitted by biblical scholars. This volume is, in fact, a storehouse of natural-history facts, intended for biblical students and teachers, and is written, it is hoped, in a true catholic spirit, and free from sectarian bias.

H. COULTAS.

A FEW words will suffice to explain my connexion with this volume.

It is well known that our authorized version of the Bible, with all its acknowledged excellencies, contains many errors in the department to which the present work relates. Two hundred and fifty years have not passed without adding to our knowledge of the true meaning of Hebrew words, and greatly enlarging our acquaintance with the Natural History of Bible lands. Many passages have lost their force for the English reader because the fitness of Scripture language has been hidden by the mistake of a translator. Not a few objections to the truth of Scripture narratives owe their plausibility to the same cause. No thoughtful reader will lightly value indications of minute accuracy in the descriptions given by the sacred writers, or will be indifferent to any explanation which brings into relief their graphic power. If, therefore, a work on the zoology of the Bible is really to attain its end, its contents must not be defined by the authorized version. It has been my endeavour to secure that the present volume shall answer to the original text of Scripture. I have not attempted to describe or teach, but chiefly to supply a complete list of subjects for description. The best authorities have been used throughout; and in cases of doubt all opinions have been mentioned which seemed to deserve consideration.

WILLIAM F. MOULTON.

CAMBRIDGE,

June 6, 1876.

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Page 181, line 28.—For Deut. iv. *read* Deut. xiv.

THE
ZOOLOGY OF THE BIBLE.

INTRODUCTION.

ZOOLOGICAL CLASSIFICATION OF THE ANIMALS OF THE BIBLE.



THE Animal Kingdom has been sub-divided by naturalists into two sub-kingdoms.

I. Vertebrata (Lat. *verto*, I turn), or vertebrated animals, having the central portion of their nervous system, or their brain and spinal cord, enclosed, the former in a cranium or skull, and the latter in a bony canal formed by a succession of bones called vertebræ, which are united together by intervening cartilage.

This sub-kingdom is divided into four classes.

1. **MAMMALIA** (Lat. *mamma*, a teat). Warm-blooded animals which suckle their young, bringing them forth alive (*viviparous*). Ex. The monkey, lion, leopard, and whale.

2. **AVES** (Lat. *avis*, a bird). Warm-blooded animals covered with feathers instead of hair, and organized for flight in the atmosphere; bringing forth their young from eggs (*oviparous*). Ex. Eagle, vulture, and hawk.

3. **REPTILIA** (Lat. *repto*, to creep). Cold-blooded animals, having the skin smooth, or covered with scales or hard bony plates; terrestrial or aquatic. Oviparous. Ex. Frog, chameleon, adder, and tortoise.

4. PISCES (Lat. *piscis*, a fish). Cold-blooded vertebrated animals, covered with scales, respiring by gills, and organised for life in the water. Oviparous. No species mentioned in Scripture.

These four classes are each sub-divided into orders as follows :—

a. THE CLASS MAMMALIA.

The beasts mentioned in the Scriptures are all included in this class, and contained under the following orders :—

1. Quadrumana (Lat. *quatuor*, four, and *manus*, the hand), or four-handed animals, fitted in an especial manner for climbing trees. Ex. Ape.

2. Cheiroptera (Greek, *cheir*, the hand, and *pteron*, a wing), or hand-winged animals, comprehending those which have the anterior extremities, especially the hands, so modified as to serve the office of wings, the fingers being extremely lengthened, and connected together by a membrane. Ex. Bat.

3. Carnivora (Lat. *caro*, *carnis*, flesh, and *voro*, I devour). Flesh-eaters, including those animals which have the teeth particularly adapted for destroying living prey, and for tearing, dividing, or bruising flesh. Ex. Lion and leopard.

4. Cetacea (Greek, *ketos*, a whale). An order of mammals living in large seas, and shaped like fishes for moving habitually in the watery element in which they live. Ex. Whale.

5. Ruminantia (Lat. *ruminare*, to ruminate), or animals which ruminate, or chew the cud, having a complicated stomach and a cloven hoof. Ex. Camel, goat, sheep, and ox.

6. Rodentia (Lat. *rodo*, I gnaw). Gnawing animals, having two pairs of curved, permanent, chisel-shaped incisors in each jaw, from two to six molars on each side, and no canine teeth. Ex. Hare, mole rat, and field mouse.

7. Pachydermata (Gr. *pachus*, thick, and *derma*, a skin), or thick-skinned animals. Ex. Horse, ass, wild boar, behemoth, and coney.

b. THE CLASS AVES.

The birds mentioned in the Bible are all included under the following orders of this class :—

1. Raptores (Lat. *raptor*, a robber), or birds of prey, which live by rapine, having a strong, curved, sharp-pointed beak, short robust legs, and a foot furnished with three toes before and one behind, which are armed with long, strong, curved, and more or less retractile talons, adapted to seize and lacerate a living prey. Ex. Eagle, vulture, hawk, and owl.
2. Cursores (Lat. *curro*, I run), or running birds, with wings unfitted for flight, and feet formed for running swiftly over the ground. Ex. Ostrich.
3. Insessores (Lat. *insessus*, perched), or perching birds, having three slender and flexible toes before and one behind, with claws long, pointed, and slightly curved; having a foot, in fact, organised for nest building, and for grasping the slender branches of trees, and perching on them. Ex. Sparrow, raven, night hawk, and swallow.
4. Scansores (Lat. *scando*, I climb), or climbing birds, having the four toes arranged in pairs, two before and two behind, a conformation of the foot most suitable for climbing. Ex. Cuckoo.
5. Rasores (Lat. *rado*, I scratch), or scratching birds, having three toes before and one behind, strong, straight, and terminating in robust obtuse claws, adapted for scratching up the soil. Ex. Common barn-door fowl, partridge, and quail.
6. Columbidae (Lat. *columba*, a pigeon), or doves and pigeons.
7. Gallatores (Lat. *grallator*, a stalker), or wading birds, having long slender legs, which seek their food in water along the margins of rivers, lakes, and seas. Ex. Stork, bittern, lapwing, heron, and crane.
8. Natatores (Lat. *natator*, a swimmer), swimming birds, including those which have the toes united by an intervening membrane, adapted for aquatic life. Ex. Pelican and cormorant.

c. THE CLASS REPTILIA.

The reptiles of the Bible, included in this class, are all comprised within the following natural orders.

1. Chelonians (Gr. *chelone*, a tortoise), characterised by the enclosure of the body in a double shield, from which the head, tail, and four extremities are capable of being protruded by the animal, or retracted when necessary for its protection. Ex. Tortoise.

2. Saurians (Gr. *sauros*, a lizard), animals having four legs and the body covered with scales, living on the land and in the water. Ex. The chameleon and crocodile.

3. Ophidians (Gr. *ophis*, a serpent), reptiles devoid of limbs and a sternum or breast-bone, and consisting of a skull or cranium and a spinal column or back bone only, composed of a great number of vertebra, united with each other by a ball and socket joint, the whole being therefore extremely flexible. The body is covered with scales. Oviparous. Ex. Adder.

4. Batrachians (Gr. *batrachos*, a frog), amphibious reptiles, having naked skins; in the early stage of their existence living in the water, and breathing by gills; afterwards living on the land, and breathing by lungs. Ex. Frog.

d. THE CLASS PISCES.

The fishes are only mentioned in the most general terms in the Bible, so that it is impossible to determine even the orders to which reference is made.

The second grand division of the Animal Kingdom is included under the sub-kingdom—

II. **Invertebrata**, or animals destitute of a cranium or skull and a vertebral column.

The invertebrated animals of the Bible are all included within the following classes and orders :—

a. THE CLASS MOLLUSCA.

THE MOLLUSCA (Lat. *mollis*, soft), are soft-bodied animals, possessing an extremely flexible skin, which lies so loosely about the body, that it has been called the cloak or mantle, and usually protected by a hard calcareous covering or shell, which is secreted by the mantle, and increases in size in proportion to the growth of the animal. There are only two orders of molluscs referred to in the Scriptures.

1. Gasteropoda (Gr. *gaster*, the belly, and *pous*, a foot), or belly-footed univalve molluscs, with a distinct head (*encephala*), crawling slowly with a sort of gliding motion, upon a broad muscular disc, on the lower surface of the body, which serves as a substitute for legs. Ex. Snail and Slug.

2. Lamellibranchiata (Lat. *lamella*, a thin plate, and *branchiæ*, gills), or plate-gilled bivalve molluscs, without a head (*acephala*), having their gills in the form of membranous plates. Ex. Pearl oyster.

b. THE CLASS ARTICULATA.

THE ARTICULATA (Lat. *articulus*, a joint), are animals having their bodies and limbs composed, more or less distinctly and numerous, of moveable pieces, united or articulated together in segments and rings. Those mentioned in the Bible are all comprised in the following orders :—

1. Arachnida (Gr. *arachne*, a spider), having the head and thorax confluent, the body consisting of only two pieces, called the cephalo-thorax (Gr. *kephale*, the head, and *thorax*, the breast), and abdomen (Lat. *abdomen*, the belly), the former having eight legs and smooth eyes. Ex. Scorpion and spider.

2. Insecta (Lat. *in*, into, and *seco*, I cut), having the body divided into three pieces, called the head, thorax, and abdomen, six legs being articulated with the thorax. Ex. Bee, ant, and locust.

3. Annelida (Lat. *annulus*, a little ring), or animals having soft and pliable, more or less cylindrical, bodies, formed of a great number of small rings. Ex. Earthworm and leech.

c. THE CLASS RADIATA.

THE RADIATA (Lat. *radius*, a ray), or radiated animals, having their limbs or arms diverging in every direction like radii from a common centre. Only one order is distinctly mentioned in the Bible.

1. Zoophyta (Gr. *zoon*, an animal, and *phyton*, a plant), or zoophytes. Ex. Coral.

d. THE CLASS PROTOZOA.

THE PROTOZOA (Gr. *protos*, first, and *zoon*, an animal), or first animals, belonging to the lowest type of organization. The Scriptures refer to only one order.

1. Porifera (Lat. *porus*, a pore, and *fero*, to bear), or sponges, Ex. Sponge.

PART I.

VERTEBRATED ANIMALS.

CHAPTER I.

THE MAMMALIA.

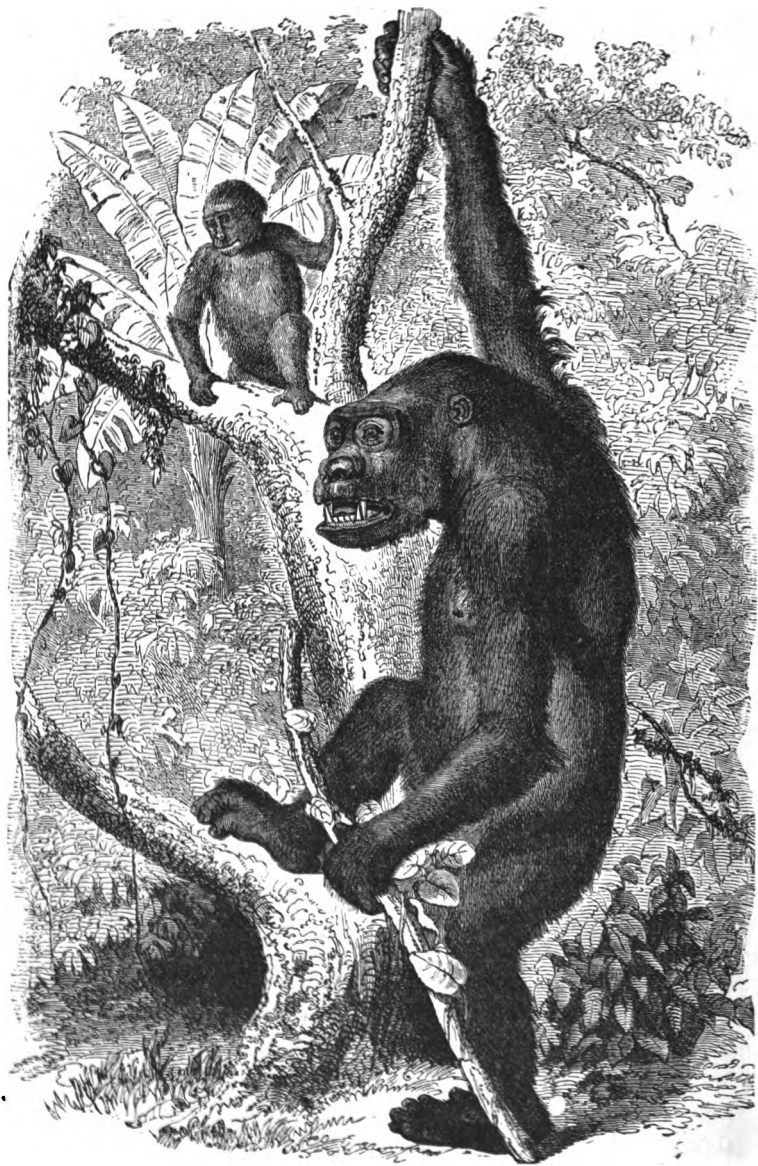
Order 1.—Quadrumanæ, or Four-handed Animals.

THE APE.



THE principal character of this group consists in the structure of their extremities, their four feet being all furnished with opposable thumbs, so that they are in fact converted into hands. These animals are thus most admirably fitted for their life among the trees,—up, down, and along the branches of which they run with the most admirable ease and agility. In some large divisions of the group—American monkeys, for example—the opposable thumbs are confined to the hind-feet, whilst the fore-feet are deprived of them; and in other groups a fifth hand is added to the four already possessed, in the shape of a long prehensile tail, which is of great service to the animal in facilitating its passage from tree to tree, by enabling it to suspend and swing itself from one tree to another.

The quadrumanæ are confined almost exclusively to the tropical parts of the earth, where they live in troops in the forests, dwelling among the branches of trees, and adding insects,



lizards, eggs, and young birds to their usual food of fruits and vegetables. They are of all sizes, some of the Apes even exceeding man in stature, whilst others are not larger than a squirrel.

Various anecdotes are related as to the superior intelligence and docility of the man-like apes, such as the chimpanzee and the orang-outan, which make the nearest approach to man in bodily structure and mental characteristics permitted to the lower animals, although separated far from him by a vast and impassable barrier. For (Gen. i. 25) "God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind;" but (ver. 27) "God created man in His own image, in the image of God created He him; male and female created He them."

Another species of chimpanzee has been recently discovered by M. du Chaillu, a French naturalist, on the western coast of Africa, called the gorilla, which is a most formidable animal, particularly as the male always attacks man when he sees him. It is, when found in the adult state, between six and seven feet in height, and with strength in proportion to its gigantic stature. The gorilla is found in the densest and darkest recesses of the African forests, roars terribly when disturbed, and is so fierce that the hunters have never yet been able to capture one alive. In one instance, however, a young one was saved, after the mother had been shot. This little monkey was seated on the ground not far from the mother, eating berries and vegetables, upon which the gorilla feeds. The picture on the adjoining page shows this gorilla and her young one. When the hunters fired, the mother fell dead, and the young one ran up to her, embraced her, and hid his head in her bosom, thus showing unmistakable marks of sorrow at her sad fate. He was secured after his captors had received two severe bites. He was a little fellow, not three years old, but, at the same time, a little savage; for neither kindness nor sternness could tame him. At

first he was placed in a cage, the bars of which he forced, and was found hid under a bed. When discovered, he came out into the middle of the room, and began examining its furniture with evident curiosity. A net was thrown over him: once more he was confined. His temper grew worse and worse, and again he escaped. At last he was chained up, and it took an hour to do this. Ten days after he died.



There can be no question but that the quadrumanous animals surpass all others in adroitness and cunning, as the following account will show :—

Some time ago a ship sailed for England from a port in the West Indies, the captain of which had taken four monkeys on board, and also a quantity of very fine grapes. The monkeys were allowed to wander at will around the ship, and soon after the vessel had put to sea the grapes which the captain had hung up in his cabin began to disappear from it in the most unaccountable manner. The monkeys were suspected, and they were watched for some time, but nothing was discovered. The bunches of grapes continuing to disappear despite these precautions, the captain himself determined to watch, and "that he might mete out due punishment to the offenders when caught, he provided himself with a rope's end," and lying down in his cabin, pretended to sleep. This was in the morning, about the time that the monkeys were let out of the cage, where they were confined for the night. The captain had just time to settle, when down came the whole troop of monkeys from the deck, halting, however, at the cabin door, as if surprised to find the cabin occupied. Here they remained for some time in deep consultation, concocting their little plan of action. At length one of them mounted the table, and cautiously approached the apparently sleeping captain, and stood steadfastly regarding him for some time ; he next slowly raised the captain's eyelid, to see if he really were asleep, the others eagerly watching the result of the experiment ! The whole thing so amused the captain, that he laughed loudly. Whereon the whole tribe of sly pilfering rascals scampered back to the deck, filled with a wholesome dread of those consequences which would most assuredly have followed their next invasion of the cabin in search of grapes.

The ape is only mentioned twice in the Bible. It is named among the articles of merchandise imported from Ophir in Solomon's ships (1 Kings x. 22) : "For the king had at sea a navy of Tharshish with the navy of Hiram : once in three years came the navy of Tharshish, bringing gold and silver, ivory, and apes, and peacocks." See also the parallel passage, 2 Chron. ix. 21. Now as the ape is not indigenous to Palestine, all that was known about

these animals by the Jews was obtained from the few specimens which were brought into Palestine from foreign countries. It is evident that apes were regarded as extremely rare, otherwise they would not have been thus mentioned as adjuncts to the wealth of Solomon.

As to the species of monkey imported by Solomon, this can only be approximately determined, supposing our knowledge to be correct as to the countries visited by his vessels. The peacock is mentioned along with the ape, and the mention of that bird would indicate some part of Asia as having been visited. Now we know that in India and also in Ceylon, "ivory and apes and peacocks" do exist, and it is therefore probable that from these countries these animals were brought. We are told that Solomon was learned in the study of natural history; it is therefore only in accordance with what we know of his character, that he should take both a pride and pleasure in having within his palace, by means of his numerous ships, the rarest natural-history objects of intrinsic value, whether remarkable for their beauty as peacocks, or distinguished for their ugliness as apes.

But if the navy of Solomon visited India, then it is not at all improbable that one of the apes selected and brought over from that country was the *Semnopithecus entellus* (Greek *semnos*, venerable, and *pithekos*, an ape), or the Indian sacred monkey, an animal which has been worshipped for many centuries in India, and still receives divine honours from the natives. The wonderoo, another ape abundant in Ceylon, may have also been taken on board the ships of Solomon whilst they were anchored off the coast of that island, as it is more an ape remarkable for its look of wisdom and importance and the gravity of its demeanour, and is therefore just the animal likely to have been acceptable to such a naturalist king as Solomon, from the fine caricature in its countenance, of those most admirable qualities which he himself possessed as a legislator and monarch.

The *Entellus*, or sacred monkey of India, generally takes up its residence in the groves which the natives plant around their villages,

and it is considered an act of very great sacrilege to disturb or drive it away. The celebrated banyan tree, which forms a grove in itself, is the residence of a numerous colony of these animals. "Splendid and costly temples are dedicated to these animals; hospitals are built for their reception when sick and wounded; large fortunes are bequeathed for their support; and the laws of the land, which compound for the murder of a man by a trifling fine, affix the punishment of death to the slaughter of a monkey."

In Isa. xxxiv. 14, and xiii. 21, it has been thought that the word translated "satyrs" denotes baboons (*Cynocephalus*). The *Cynocephalus hamadryas* was formerly well known in Egypt (see Bible Educator, vol. i. p. 16).

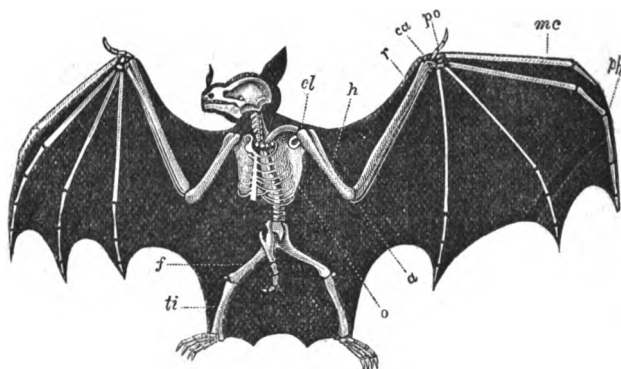
Order 2.—*Cheiroptera, or Hand-winged Animals.*

THE BAT (*Vespertilio*).

This order includes the only species of the class Mammalia which have the power of flight, and have wings truly organized for that purpose. There are indeed some two or three species belonging to other orders of mammals to which the term flying is applied. Thus among the monkeys we have the flying lemurs, and among the rodents, or gnawing animals, the flying squirrels; but, strictly speaking, these animals do not fly, but only glide through the air, by means of an expanded skin, which serves to give their bodies additional buoyancy.

In the bat we have a beautiful exemplification of that creative law which adapts the size of the parts of the skeleton to the habits of the animal, in one instance reducing the same bones to a minimum and in another evolving them to a maximum. If we take the anatomical structure of the arm, forearm, and hand of a man as typically representing the highest conditions of those parts, we find in the wing of the common bat the following modifications of them. The single bone of the arm, or humerus, *h*, and the two bones of the forearm, or the radius, *r*, and the ulna, *u*, in man, are both present in the bat; but whilst the arm is long in proportion

to the body of the bat, the forearm is greatly prolonged. The small bones of the carpus, *ca*, or wrist in man, are also there, but without any apparent elongation ; whilst the four metacarpal bones, *mc*, which form the palm of the hand, and the phalangeal, or true finger bones, *ph*, are lengthened out in a most extraordinary manner. Over the framework of the hand and finger bones, arm and forearm, thus modified, is stretched the delicate leathery membrane of the wing, which is continued between the legs, consisting of femur, *f*, and tibia, *ti*, and down the sides of the body to the feet. Hence the order is termed Cheiroptera (Gr. *cheir*, a hand, and *pteron*, a wing). The bones of a bat's wing, in fact, form a frame-



Skeleton of Vampire Bat.

work on the same principle of construction as that of an umbrella, being capable of both expansion and enclosure, according to circumstances. Thus, when the bat is on the wing, not only the four fingers are stretched out widely from each other, but even the four metacarpal bones forming the palm of the hand, which in man always continue close together and parallel, take the same radiant direction, separate widely from each other, and form the same cop-
tinuous line as the fingers. On the contrary, if the bat is not flying, the bones of the palms and fingers thus radiated out are closed, like the stretchers of an umbrella, the wings being folded together.

The thumb of the bat (Lat. *pollex*, a thumb), *po*, does not partake of this extraordinary elongation, but remains free, and is furnished with a hooked nail, which is a most useful organ of locomotion; for, after the bat has satiated itself with its insect prey, and, tired of wheeling itself in the atmosphere during the night, has folded its wings together, it uses its hooked thumbs to lay hold of any irregularity, and to draw itself forward, and can thus climb with ease the rugged and perpendicular surface of the hollow tree, and enters its sleeping-room in its interior. Here it suspends itself, head downwards, by the claws of its hind-feet, fastening



Vampire Bat.

them into the decayed wood, and remaining asleep during the day, until the hour of evening again comes, when it once more resumes its wonted activity and its flight like a bird through the atmosphere. In winter, bats remain suspended in their dormitory, in the cave, hollow tree, or hole in the chimney, in a state of torpor and inactivity, at least in our climate.

The body of the bat, like that of the other mammalia, consists of the clavicle, *cl* (Lat. *clavis*, a key), or collar bone, and the sternum, or breast bone, in front; of the dorsal vertebræ and scapulæ, *o*, or shoulder blades, behind; and of the ribs, which, articulating with the dorsal vertebræ behind, arch forward, and

unite with the sternum in front, thus forming the cavity of the thorax or chest in which is lodged the organs of respiration and circulation.

Bats are found in almost all parts of the world, Australia included, but are the most numerous and of the greatest size in warm climates. Some of them feed on insects, as the common English bat; others on fruits, as the bats of Palestine and Java; and the rest on blood, as the vampire bats of the tropical portions of South America. All are nocturnal, avoiding the light, and frequenting dark places in the rocks and among deserted ruins, which they do for years, so that their haunts become intolerably offensive on account of the stench of their ordure.

Bats by the law of Moses are considered to be unclean animals, and as such were forbidden as food to the Jews. (Lev. xi. 19,) "The lapwing and the bat are unclean." It is not surprising that such a regulation should have been made, when we consider the exceedingly repulsive habits of the bat, dwelling in the midst of gloom, filthy in itself and in its habitation. If these facts in its natural history be remembered, the reader will be able to appreciate to some extent the force of the prophecy (Isa. ii. 20), "In that day a man shall cast his idols of silver and his idols of gold, which they made each one for himself to worship, to the moles and to the bats." Instead of building them splendid temples, he shall throw them into the filthy caverns frequented by these animals; instead of adoring them with insensate prostrations and offerings, he shall treat them with the utmost contempt, as unworthy even of a thought, fling them away as rubbish, and devote them to utter destruction.

The word bat also occurs in Deut. xiv. 18, and Lev. xi. 19, where it is not surprising to find it mentioned among birds.

Order 3.—Carnivora, or Flesh-eating Animals.

These animals, next to the monkeys, are the most closely allied to man in organization. Those mentioned in the Scriptures may

be divided, according to their mode of progression, into three leading groups.

1. The Digitigrada, or finger walkers (Lat. *digitus*, a finger, and *gradior*, I walk), from their habit of walking on their toes. Ex. Lion, leopard, dog, wolf, jackal, and fox.

2. Plantigrada, or sole walkers (Lat. *planta*, the sole of the foot etc.), because they tread upon the whole, or the greater part of the sole of the foot when walking. Ex. Bear and badger.

3. Pinnigrada (Lat. *pinna* a fin, and *gradus* a step), or fin-walkers. Ex. Monk seal.

I. THE DIGITIGRADE CARNIVORA.

THE LION (*Felis Leo*).



The lion belongs to the natural order Carnivora, or flesh-eating animals, and to the family Felidæ (Lat. *felis*, a cat), so called by

Linnæus, because structurally he is allied to the common domestic cat—the lion being, in fact, only a gigantic tropical cat ; and a similar observation applies to the tiger, leopard, and panther, all of which belong to the cat family. These animals are all characterised by the possession of strong, sharp, recurved, and retractile talons, with which their toes are all armed ; they have also teeth to correspond, peculiarly well adapted for destroying other animals, and for tearing, crushing, and dividing their flesh ; their tongue is also armed, being covered with a hard skin and horny prickles, enabling them to remove, as with a rasp, every particle of flesh and skin from the bones. Their sight is keen, to enable them to see their prey, and they have great power of dissembling, so as to be able to lure their victims to destruction. It is, indeed, wisely ordered that these powerful, ferocious, and bloodthirsty animals should be solitary in their habits ; otherwise, had they been endowed with the instinct of sociality, what could have withstood the attack of a troop of lions, hunting in concert like a pack of wolves ?

The lion has in all ages been regarded as the personification of courage and magnanimity. That an animal clothed with such formidable natural armour as he possesses should be courageous is natural enough. His courage and strength are both undeniable, facts in his natural history well known to the hunter and naturalist, and endorsed by the following passage in the book of Proverbs (xxx. 30) : “A lion, which is strongest among beasts, and turneth not away from any.” “The immense masses of muscle around the lion’s jaws, shoulders, and fore-arms,” says Dr. Livingstone, “proclaim tremendous force. Most of those feats of strength that I have seen lions perform—such as the taking away of an ox—were not carrying, but dragging or trailing the carcass along the ground.” But the reputation of the lion for magnanimity is not so well established, for, in reality, he is as genuine a cat as the tiger, and quite as crafty, cruel, and bloodthirsty in his disposition. So far from being magnanimous, the lion is treacherous. Always preferring a covert to an open attack, he usually approaches his prey stealthily, and

by night. "By day," says Dr. Livingstone, "there is not, as a rule, the smallest danger of lions which are not molested attacking man, except during the breeding seasons." During the daytime the African lion lies sheltered from the burning rays of the sun at the foot of some huge over-hanging rock, or concealed beneath the brushwood with which the surface of the desert is usually covered, and at night he moves with noiseless stealthy step towards his sleeping prey, generally some herbivorous animal, such as a goat, antelope, or buffalo; or he may be met with at this time prowling or lying in wait in the neighbourhood of the springs or streams of water where these animals usually come to drink. To enable these terribly dangerous and cruel tropical cats to move with noiseless footstep on their unsuspecting victims, the lower surface of the foot has been furnished with ball-like pads of epidermis, upon which the animal steps gently and inaudibly. This beautiful mechanism is easily seen and examined in the foot of the common cat (*Felis domesticus*).

There is frequent allusion in the Bible to the roaring of the lion when out in quest of food, and the terror with which it inspires the rest of the animal creation. See Amos iii. 4 and 8: "Will a lion roar in the forest, when he hath no prey? Will a young lion cry out of his den, if he have taken nothing?" "The lion hath roared, who will not fear?" See also 1 Peter v. 8: "Be sober, be vigilant; because your adversary the devil, as a roaring lion, walketh about, seeking whom he may devour." On fine quiet moonlight nights, when the lion is out in search of prey, his terrifying roar is distinctly heard by the rest of the animals which have sunk into slumber for the night. Starting up from their slumbers, they fly together for protection, or scatter in all directions over the plain, sometimes running into the very jaws of their adversary. On stormy nights especially, the lion is said to be particularly active, as the panic produced among his victims by the strife of the elements renders less caution necessary on his part in approaching them. On such a night, amid the warring of the elements, the roaring of the winds, and almost continuous roll of thunder resulting from

incessant flashes of lightning, and deluges of rain pouring down on the burning earth from the darkened heavens above, it is not to be wondered at that the approach of the lion is unperceived, and it is impossible to imagine anything more grand and terrific than a sudden encounter with a bloodthirsty lion under such circumstances.

There can be no doubt that lions were once found in Europe. Herodotus tells us that the baggage camels of the army of Xerxes were attacked by lions, the other beasts and men remaining untouched; and Pliny affirms that the lions of Europe were stronger than those of Africa and Syria. It is certain, however, that lions are only found now in certain limited portions of Asia and Africa, where the area over which they roam is becoming every year more restricted in its extent. They have become extinct in Egypt, Palestine, and Syria, where it is evident, from numerous passages in the Scriptures, that they formerly abounded. Thus the future power of the Jews is described by Balaam the prophet, when he viewed the innumerable tents of Israel from the heights of Pisgah, under the symbol of a lion, an animal which at that time the Jews must have been very familiar with in the wild state. Numb. xxiii. 24: "Behold, the people shall rise up as a great lion, and lift up himself as a young lion; he shall not lie down until he eat of the prey, and drink the blood of the slain." Again, in the 19th chapter of the book of the prophet Ezekiel, "a lamentation" is taken up for the "princes of Israel," under the parable of lions' whelps taken in a pit. See verses 1—9, which clearly allude, not only to the carnivorous propensities of the lion, but to his mode of capture in ancient times. The following paragraph from the writings of Major Denham, the well-known African traveller and explorer, is very interesting, as showing incidentally the fidelity of the prophet's description:—

"The skin of a noble lion was sent me by the sheikh, measuring, from the tail to the nose, fourteen feet two inches. He had devoured four slaves, and was at last taken by the following stratagem: The inhabitants assembled, and with loud cries and noises drove him

from the place where he had last feasted. They then dug a very deep circular hole, armed with sharp pointed stakes ; this they most cunningly covered with stalks of millet. A bundle of straw enveloped in a mantle was next laid over the spot, to which a gentle motion like that of a man turning in sleep was occasionally given by means of a line carried to some distance. On their quitting the spot, the noise ceasing, the lion returned to his haunt, and was observed watching his trap for seven or eight hours, by degrees approaching closer and closer ; and at length he made a dreadful spring on his supposed prey, and was precipitated to the bottom of the pit. The people now rushed to the spot, and before he could recover himself despatched him with their spears.”—*Denham's "Africa."*

The usual mode of a lion's death in a state of nature—supposing him to have received no injury from accidents or in fighting with other animals—is through hunger, the result of his utter inability to catch prey. His teeth are all either broken or decayed, and, old and enfeebled, he is left to die alone in his den. What a contrast to his former condition when young and rejoicing in the greatness of his strength ! Then (Nahum ii. 12) “The lion did tear in pieces enough for his whelps, and strangled for his lionesses, and filled his holes with prey, and his dens with ravin.” But now (Job iv. 11) “The old lion perisheth for lack of prey, and the stout lion's whelps are scattered abroad.”

There are at least six names in the Old Testament for the lion. The most common, which is a general one, occurs eighty times. It is always translated lion, except in Numb. xxiii. 24, where, for “young lion,” we should read “lion.” Another word, especially expressive of strength, occurs three times: Prov. xxx. 30; Isa. xxx. 6; Job iv. 11; in the last two passages it is rendered “old lion.” A poetical name for lion, meaning “roarer,” occurs, Job iv. 10, x. 16, xxviii. 8; Ps. xci. 13; Prov. xxvi. 13; Hos. v. 14, xiii. 7;—in Job it is rendered “fierce lion.” A different word—which is rendered “old lion” (Gen. xlix. 9; Nahum ii. 11), “young lion” (Isa. xxx. 6), “great lion” (Num. xxiii. 24, xxiv. 9;

Joel i. 6), "stout lion" (Job iv. 11), and "lion" (Deut. xxxiii. 20 ; Job xxxviii. 39 ; Isa. v. 29 ; Hos. xiii. 8)—probably means lioness. Two similar words, each occurring once only (Ps. lvii. 4 ; Nah. ii. 12), denote respectively lion and lioness. The word commonly and correctly rendered "young lion" occurs more than thirty times : in Ps. xxxv. 17, Prov. xix. 12, xx. 2, xxviii. 1, Jer. xxv. 38, li. 38, it is rendered "lion." The context will suggest what is really the truth, that this word does not denote a cub. One other passage must be noticed—Job xxviii. 8—where, for "lion's whelps," we should read "sons of pride;" the meaning being "proud beasts." The familiarity of the inhabitants of Palestine with the lion, and the terror he inspired, is illustrated by the fact that in Hebrew there are as many as four different words to express his roar. "One (Judges xiv. 5 ; Ps. xxii. 13, civ. 21 ; Amos iii. 4) denotes the roar of the lion while seeking his prey ; another (Isa. v. 29) expresses the cry which he utters when he seizes his victim ; a third (Isa. xxxi. 4) the growl with which he defies any attempt to snatch the prey from his teeth ; and a fourth (Jer. li. 38) is descriptive of the cry of the young lions."¹

The lion is more disposed to exhibit varieties than any other species of the family, except the domestic cat. Thus the African lion (*Leo Africanus*), which has a long flowing beard, and is a larger and more powerful animal than the short-maned Asiatic lion, and therefore presents a nobler appearance as he steps forth on the sands of his native desert, has nevertheless several distinct varieties, as the Barbary breed, the Senegal breed, and the Cape breed, all presenting slight differences from each other in the development of the mane and the colour of the fur ; and the short-maned lion of Asia presents similar varieties in the Bengal, Persian, and Arabian breeds, known to naturalists by the same characteristic distinctions, except that in one variety of limited geographical range, recently discovered at Guzerat, and described as the maneless Indian lion (*Leo goojrattensis*), the mane is quite absent.

¹ See Smith, Dictionary of the Bible, vol. ii. p. 126.

Amidst such a variety of lions, how are we to determine the lion of the Bible? The whole question would seem to resolve itself into one of Biblical Geography. Studied from this point of view, it is much simplified. Now it is a remarkable and interesting fact that there is only one reference to the lion in the Scriptures, where the scene is laid on African ground, and that is Jacob's prophetic blessing on Judah, which was pronounced on him at Goshen, in the land of Egypt (Gen. xlix. 9): "Judah is a lion's whelp: from the prey, my son, thou art gone up: he stooped down, he couched as a lion, and as an old lion; who shall rouse him up?" And yet Jacob, who had spent the greater part of his life in Asia and as a sojourner in the Holy Land, of which God afterwards gave his descendants possession, most probably refers in this language, not to the African lion, but to that of Asia, with which he must have been more familiar.

It will, however, occur to the intelligent reader, that Moses, who was brought up in Egypt, and "was learned in all the wisdom of the Egyptians" (Acts vii. 22), must have been well acquainted with the African lion, and may possibly refer to it in clearer and more definite language in the Pentateuch. But we are unable to find that he does. And this is not surprising, when it is remembered how intensely the Hebrew legislator and lawgiver hated Egypt and everything Egyptian, and that after the memorable passage of the Red Sea, and the defeat of the pursuing hosts of Pharaoh, the subsequent events of Jewish history, as the punitive wanderings for forty years in the Arabian wilderness, the conquest and occupation of Palestine, the captivity in Babylon, and the restoration and rebuilding of the Jewish temple, all took place in Asia; when all this is recollected, it is not surprising that the noble Egyptian lion appears to have been forgotten even in the time of Moses. It is certainly not referred to in the Pentateuch.

It is therefore probable that the lion referred to both in the Old and New Testament is the short-maned lion of Asia, or at least one of its varieties. See Amos iii. 12: "Thus saith the Lord, As the shepherd taketh out of the mouth of the lion two

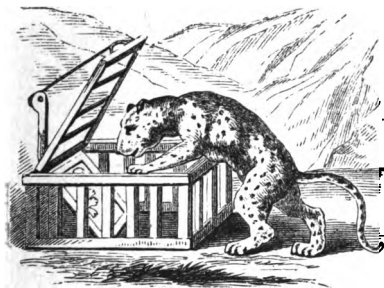


'legs or a piece of an ear; so shall the children of Israel be taken out," etc. Here the prophet must refer to the Asiatic lion. See also 2 Sam. xxiii. 20: "And Benaiah the son of Jehoiada, the son of a valiant man of Kabzeel, who had done many acts, he slew two lion-like men of Moab: he went down also and slew a lion in the midst of a pit in time of snow." Here the lion referred to must be that of Asia, as no snow falls on the burning deserts of Africa, the home of *Leo Africanus*.

The cat has been so long in the service of man, that the question as to the original wild stock from which it is descended is still undecided. It was well known to the ancient Egyptians, was domesticated by them, and is mentioned in the Apocrypha (Baruch vi. 22).

THE LEOPARD (*Felis leopardus*, Cuv).

This animal may be regarded as a smaller species of tiger, his skin being of the same bright tawny hue, elegantly marked with black spots. The leopard is about four feet in length, exclusive of the tail, which is about two feet and a half long. It is found in Africa and India, inhabiting the deepest recesses of the forest. Its habits are somewhat similar to those of the other members of

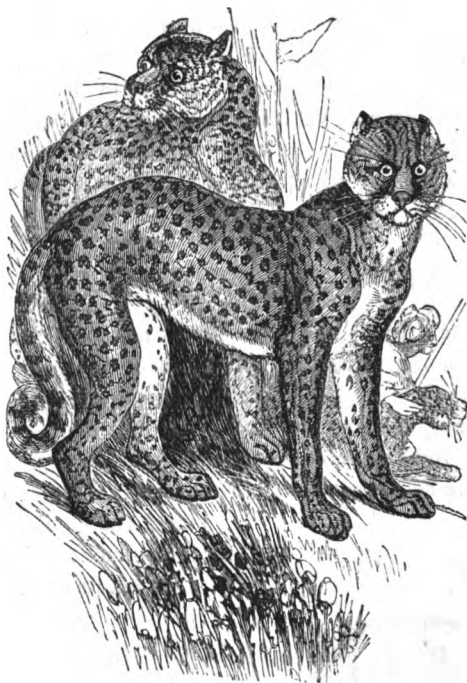


the feline family; it is stealthy in its mode of attack, cruel and bloodthirsty in its disposition, and although without the strength of the lion or tiger, is their superior in agility, climbing trees with such astonishing rapidity that few animals are safe from its ravages.

The leopard is usually taken in traps, or is hunted with dogs, until it takes refuge in a tree, and when the hunters come up, it is easily shot. In some of the old writers we have an account of

the leopard being taken in a trap by means of a mirror, upon which the animal leaps on seeing itself reflected, and thus brings the door down upon itself, and is thus secured.

The leopard is a terrible animal to deer and antelopes; and, conscious of his inferiority to them in speed, he endeavours to



The Cheetah.

make up for it by superiority in cunning. Selecting a tree from whence he can look far around, he carefully conceals himself beneath its foliage, and as soon as a deer approaches, leaps forth from his place of concealment upon the affrighted animal, strikes his claws into the quivering flesh, tears open the throat, and drinks the warm life-blood of the expiring prey; but should the deer be

at a distance, and there is no prospect of its coming nearer, then the leopard must go forth from his hiding place. This he does stealthily, and without noise, keeping as much as possible out of sight, and creeping from one place of concealment to another, until near enough to make the dreadful spring that seals the fate of his victim.

The leopard is frequently mentioned in the Scriptures, which proves that in ancient times it was not uncommon in Palestine, from which country it has now disappeared. There are frequent allusions to its lying in wait for its prey. See Jer. v. 6: "A leopard shall watch over their cities." Hosea xiii. 7: "As a leopard by the way will I observe them." See engraving, page 23. The swiftness of the leopard is referred to in Habakkuk i. 8: "Their horses also are swifter than leopards;" and in Dan. vii. 6. Its spots are mentioned in Jer. xiii. 23: "Can the Ethiopian change his skin, or the leopard his spots?"

Lastly, the leopard of the Bible, which probably includes the cheetah, or hunting leopard, is mentioned in Isa. xi. 6, and the places where it is usually found are indicated in the Song of Solomon iv. 8: "From the mountains of leopards;" and in the retired glens of the range of Lebanon this animal still exists.

The *Felidæ*, or cat tribe, including the lion, tiger, leopard, panther, and puma, with their destructive powers, were undoubtedly created to keep within bounds the multiplication of the smaller herbivorous mammalia. The latter are useful to man, and are therefore protected by him against the attacks of these ferocious carnivora, whose natural instincts for rapine and slaughter are no longer required when he takes possession of the country. These great carnivora, like the sinners before the flood, have long filled the earth with violence, and are doubtless destined at no very remote era to become extinct. Such changes in the animal world have already taken place, and will again. The Rev. Dr. Buckland, Dean of Westminster, in his "*Reliquiæ Diluvianæ*," has given a description of a cave at Kirkdale, in Yorkshire, which had been formerly inhabited by hyænas, animals only met with

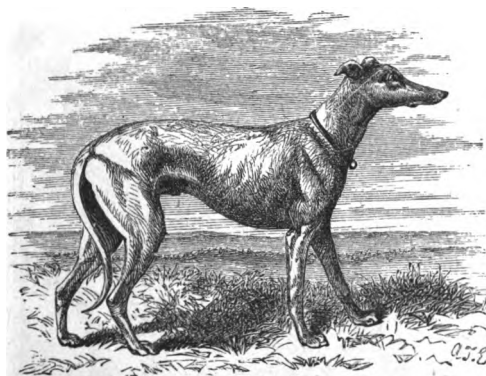
now in Asia and Africa. The hyæna lives principally on carrion, also devours the remains left by other beasts of prey, crunching the bones with its powerful jaws. The floor of the Kirkdale Cavern was strewn with the bones of the animals on which the hyænas had fed. They consisted of the remains of the great cave bear, tiger, mammoth, rhinoceros, hippopotamus, Irish elk, and other large mammalia now extinct.

We speak of the brevity of individual life, but here is proof that the life of species is equally limited. Here we have the remains of large and powerful quadrupeds, not one of which has left a descendant among the tribes now living. They lived their appointed time, performed their allotted work, and then passed away, only to be succeeded by other species whose structure is equally perfect, and who do not less efficiently their appointed work. And so it will be with the present carnivora, to whose rage and destructive instincts a boundary has been assigned by their Creator. Psalm civ. 21, 22: "The young lions roar after their prey, and seek their meat from God. The sun ariseth: they gather themselves together, and lay them down in their dens."

The Dog (*Canis familiaris*, L.?)

The dog (*Canis familiaris*, L.) belongs to the family Canidæ (Lat. *canis*, a dog), which includes dogs, wolves, jackals, and foxes. The different varieties of dog which associate with man, however much they may differ in size, colour, hair, form, and disposition, are now considered by the best naturalists to be all derived from one species; although there is some doubt as to the character of the original stock, and as to which of the varieties comes nearest to it. All the animals now employed in the service of man, or bred in captivity to supply him with food, have undoubtedly originally descended from some wild breed. These wild breeds were tamed and domesticated by man, and taught to depend on him for food and protection in ages so remote as

hardly to afford ground for anything more than the vaguest conjecture as to the native country from whence the original stock was obtained. The greatest naturalists are, however, of opinion that the great majority of the domestic animals by whose aid man was enabled to till the earth, to extend his power, and transport his commodities to distant regions in the early ages of the world, are of Asiatic origin. The camel, horse, ass, ox, goat, sheep, and dog are all of Eastern derivation, and Central Asia was probably their original home, as it is historically the only truly authentic site known as to the origin and early civilisation of mankind.



The Greyhound.

It is indeed wonderful that dogs, differing so widely in their appearance and disposition as the greyhound and mastiff, the bulldog and the spaniel, should all have had a common origin. Yet zoologists have not a doubt upon the subject, knowing well the capabilities of the dog for being educated, and how soon he can adapt himself to a change in his circumstances or mode of life. These varieties of the dog are only preserved so long as they are matched in breeding with forms of the same kind, and gradually disappear, in the course of a few generations, when they escape from domestic influences, become wild again, and breed promiscuously.

It is a well-ascertained fact that varieties in species, both in plants and animals, are increased, the former by cultivation, and the latter by domestication; and that when this artificial state of things ceases, both plants and animals revert to their originally wild forms. Thus the endless varieties of the cultivated apple are all derived from the wild crab (*Pyrus malus*, L.); and the different kinds of domestic dog are believed by naturalists to be



The Bull-dog.

all lineally descended from one common type. Now when varieties reproduce themselves permanently, they become races; and the peculiar qualities which render a plant or animal useful are generally the result of the culture or education of the race. It is well known to gardeners that variations of colour and other characters may be transmitted in plants, and it is equally well known to zoologists that peculiarities in physical structure, and

even artificial instincts, when once acquired, become hereditary in animals. One illustrative instance of the last will be enough. Thus, the dog called the retriever, peculiar to England, will stop of his own accord, and bring back game to his master ; and a retriever puppy, brought up apart from his kindred, if of the true breed, will do the same thing when grown, the first time he is taken out to hunt, and serve his master as faithfully as his fathers did before him. Now should these domesticated races acquire their liberty, as some of them have done, which have been taken from the Old to the New World, they lose all these artificially acquired instincts, and those differences in their physical structure which constituted them races ; the varieties amongst them disappear, and they thus continue to degenerate until they have again acquired the structure and natural disposition of those wild species from which they originally descended.

Some naturalists consider the dog to be only an educated variety of the common wolf (*Canis lupus*, L.). Professor Bell is of this opinion. (British Quadrupeds, p. 200.) It certainly does, at first sight, seem wholly improbable that a creature so docile as the dog should be descended from such a wild and savage animal as the wolf ; yet, when we look at this question from a natural-history point of view, there is really no very great difficulty in the way of such a supposition. The skeleton of the wolf and dog are identical, and domesticated dogs introduced from Europe into foreign countries, and which have become wild, as the dingo in Australia, approach very closely to wolves, both in appearance and habit. Besides, the generally received opinion as to the intractability of the wolf is certainly without foundation ; for it has been shown that if taken young from its wild state, and brought under kindly domestic influences and discipline, the wolf displays a considerable amount of sagacity, and is capable of quite as much attachment and obedience as the dog.

The dingos, or Australian dogs, so much resemble wolves in appearance, that they were called by the first travellers Australian wolves. They associate in packs, live wild in the woods, and

voluntarily join the native Australians in the chase of the kangaroo or other game, rendering them valuable assistance. When the hunt is over, they receive a portion of the spoil as their reward, and retire again into the woods.

The Pariah dog of India, with the dogs of Egypt, Turkey, Palestine, and other Mohammedan countries, like the dingos, own no masters, but live in packs in the neighbourhood of towns, entering them only at night-time, howling for food when hungry, and devouring carrion; they are thus very useful scavengers, and for that reason are tolerated, although much despised in all Eastern cities.

The dog mentioned in the Bible appears to have chiefly belonged to this class of animals. He seems to have accompanied the camp of the Israelites in their wanderings through the wilderness as a common scavenger, as we find this precept (Exod. xxii. 31): "And ye shall be holy men unto me; neither shall ye eat any flesh that is torn of beasts in the field; ye shall cast it to the dogs." These dogs were probably half-wild dogs, subsisting upon offal, like the Pariah dogs of the present day in Eastern cities. In later times they appear to have performed the same services in the cities of Palestine, as is evident from the circumstance that they licked the blood of Naboth, and afterwards that of Ahab and Jezebel, through whose conspiracy he was deprived of life (1 Kings xxi. 19—23). This view receives confirmation from Ps. lix. 14, 15: "And at evening let them return, and let them make a noise like a dog, and go round about the city. Let them wander up and down for meat, and grudge if they be not satisfied." Here the Psalmist evidently refers to dogs which, without an owner to provide for them, return to the city at night, after their suburban wanderings during the day, in order to feed upon such refuse as may have been thrown into the streets. To the same half-wild race of animals reference is also made in Isaiah lvi. 10, 11: "His watchmen are blind, they are all ignorant, they are all dumb dogs, they cannot bark." The dingos, Pariah dogs, and other varieties of wild dog do not bark like the domesticated dog; they can only

growl or howl. In fact, throughout the Old Testament the dog is spoken of with expressions of scorn and contempt. The Jews despised dogs as unclean animals. Hence the word dog is often used in the Scriptures as a term of reproach (1 Sam. xvii. 43; 2 Sam. ix. 8; 2 Kings viii. 13; see also 2 Pet. ii. 22; Phil. iii. 2; and Rev. xxii. 15). In Matt. xv. 26, 27, "But He answered and said, It is not meet to take the children's bread, and to cast it to dogs. And she said, Truth, Lord; yet the dogs eat of the crumbs which fall from their master's table." And in Mark vii. 28, where the same event is narrated in very similar language, there is undoubted reference made to domesticated dogs, with the usual expression of contempt and odium.

The dog seems to have been domesticated at a very early epoch. The ancient Egyptians appear to have held the dog in especial honour. Hence, when one of them died, it was embalmed and buried like any member of the family; they also shaved their heads and abstained from food under such circumstances. From some pictures on Egyptian monuments dating back some fifteen or sixteen centuries before the Christian era, we learn that the ancient Egyptians kept a great variety of domesticated dogs, some of which were admitted into the parlour, and valued, even as at the present day, for their peculiar ugliness! The story of the devoted attachment and fidelity of Argus, the dog of Ulysses, recorded in the *Odyssey* of Homer, the oldest and most gifted of the Greek poets, is well known to every classical scholar, and will bear repeating. When Ulysses left home for the siege of Troy, Argus was only a puppy. Returning in rags and in the disguise of a beggar, Argus, who had become old and infirm, was the only one who recognised him, and, overjoyed at the sight of his beloved master, wagged his tail and died. That the dog was employed as an assistant in the field by the ancient shepherd kings and princes—who, like Abraham, led a nomadic pastoral life, dwelling in tents, and whose riches wholly consisted in flocks and herds—is proved by Job xxx. 1: "But now they that are younger than I have me in derision, whose fathers I would have disdained to have

set with the dogs of my flock." It must be borne in mind, however, that Job, though a prince and a good man, was not a Jew. The passage shows that in all ages and among all nations God is no respecter of persons, but all fearing Him and working righteousness are accepted of Him.



The Newfoundland Dog.

The varieties of the dog may be accounted for in some measure by its extensive geographical diffusion, the species being scattered over the surface of the earth, from the equator to the 70th parallel, within the arctic circle—an extent of habitation only exceeded by that of man, and far beyond that of any other quadruped.

The Esquimaux dog is the only domesticated animal possessed by the Greenlanders and by the Esquimaux tribes. It is used almost exclusively for drawing sledges over the snow, from four to ten dogs being generally employed for that purpose. The driver, in command of the team, when he wishes to quicken the pace of the dogs, strikes the one next the sledge, which immediately bites the dog before him, and so the signal is carried forward to the foremost dog or leader, when the whole pack are off at a gallop. The Esquimaux dog is white, of medium size, and has a wolf-like aspect.

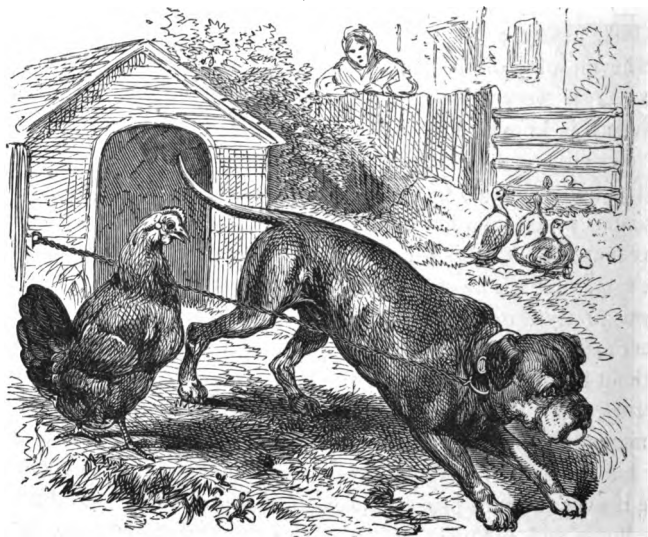
The meaning of the word rendered 'greyhound' in Proverbs xxx. 31 is very doubtful. A fine species of greyhound (the Persian) is known in Palestine, but the word more probably denotes either a *warhorse* or a *wrestler*.

The domestication of the dog is undoubtedly one of the greatest triumphs which man has achieved over the brute creation. Wherever found, the dog is the friend and companion of man, and at the same time his most faithful, laborious, and humble servant. It seems pretty certain, that the dominion of man over many of the other animals would never have been so complete, as it is now, without his aid. The dog is the most tractable, sagacious, trustworthy, and affectionate of man's four-footed friends. At the command of his master, no amount of self-sacrifice is too great for him to endure, or danger too formidable for him to encounter. He is ever ready to prove himself to be a good dog. He watches the house and premises at night with unwearied patience, whilst his master slumbers, and as for goods and valuables, they can be safely left in his charge. His courage is unflinching in the defence either of his master's person or property, and it is quite sufficient, if he is out with any juvenile members of the family to which he belongs, to ensure their protection.

The dog represented in the engraving, a noble fellow of the Newfoundland breed, saved the entire crew of a fishing-smack from a watery grave. A fearful storm was raging, and the shore was covered with fishermen anxious to aid their distressed comrades,

but powerless to do so, when this brave dog leaped unbidden into the boiling waves, rose to their surface light as a buoy, and bravely battling with their fury, reached the vessel safely, swam around it until a hawser was thrown to him, with which he swam to the fishermen, who were thus enabled to haul the vessel ashore.

The following picture represents a singular trait of canine sagacity which cannot fail to amuse our young readers. The foxes having made considerable havoc with the hens of a farm-yard, one



The Mastiff.

of them sought the protection of the watch-dog, an old rough fellow, and whilst he was stretched out in the sun, enjoying his "otium cum dignitate," hopped into his kennel and deposited her egg. Now as there was most certainly no room in the kennel for two families, as soon as she had told her secret with the usual cackle, the dog very cautiously crept in, and taking the egg in his mouth, and going to the extremity of his chain, deposited it safely on the ground. The peculiar position of the eggs for two

following days was noticed, and on the third day the dog was watched by his good mistress, and found himself rewarded for his care of her eggs by an extra bone.

The lapse of centuries has not changed the orientals, who still regard the dog with abhorrence. The dog is esteemed and valued everywhere, but in the East. What a practical confirmation have we of the truth of the Scriptures in this undeniable fact! Not a single passage can be brought forward from any part of the Bible in which the dog is respectfully mentioned, but on the contrary in every case the dog is connected with some repulsive idea. His filthy habit of eating his own vomit is especially referred to, as if to show what a beast he is, both in the Old and New Testaments: Proverbs xxvi. 11, "As a dog returneth to his vomit, so a fool returneth to his folly;" again quoted in 2 Peter ii. 22, "But it is happened to them according to the true proverb, The dog is turned to his own vomit again, and the sow that was washed to her wallowing in the mire." In eastern countries the traveller finds none of that most remarkable variety which distinguishes the dogs of Europe and America. He never sees the sturdy mastiff, the silent courageous bull-dog, the noisy, intelligent, and somewhat impertinent terrier, the gentle silky-haired spaniel, and noble kind-hearted Newfoundland; on the contrary, the dogs are all the same cowardly, gaunt, half-starved animals, more like wolves than dogs, without masters and without homes, useful only as scavengers. Charitable people in the East may sometimes feed them, but they never make them companions, as their very contact is considered to be pollution. Yet these animals, when kindly treated, and an endeavour is made to establish that relationship which should subsist always between man and the dog, lose their wild and savage appearance, and there is therefore no doubt whatever that these eastern dogs could, under better circumstances, be brought in a short time by training to as much perfection and variety of useful traits of character and organisation as their brethren of the western world. See "Bible Animals," by Rev. John George Wood, London, 1869, article "Dog."



The Fox, or Jackal.

THE FOX, OR JACKAL (*Canis aureus*, L.)

The fox is included in the family Canidæ, or dogs; but these animals have been formed by naturalists into a separate group, on the ground that the pupil of their eye is oblong, whilst in the dog, wolf, and jackal, it is circular. The fox is a solitary, nocturnal animal, easily distinguished by its long sharp nose, bushy tail, and peculiar odour. Its cunning is proverbial, and its appearance certainly indicates great craftiness of disposition. The burrow of the fox is either excavated by itself, or it is taken by force from some other burrowing animal, such as a badger or rabbit. However acquired, it is usually found in some wood near a hamlet or a farm-house.

The fox feeds upon game and poultry, being well known for its depredations in the farm-yard. It is therefore a nuisance in a neighbourhood, and were it not for its artificial preservation for sporting purposes, would long ago have been extirpated from this country, like the wolf.

There is good ground for the belief that where the words "fox" or "foxes" occur in the Scriptures, the animal referred to is usually the jackal (*Canis aureus*) of naturalists; for not only does the Hebrew word *shual* differ but slightly in sound from *chacul* or *chical*, the Arabic word for jackal, but these animals are extremely abundant in Syria, and very fox-like in their appearance. The jackal, however, differs from the fox, not only in the possession of a circular pupil, but it is gregarious, free from the unpleasant odour by which the fox is known, and more addicted to the use of carrion, to which the fox never resorts, excepting in times of scarcity. The jackal would appear to hold an intermediate position between the wolf and fox, resembling the former in its habits, and the latter in its appearance. We have mentioned these facts, now generally admitted by the best biblical scholars and naturalists, in the hope that they will be interesting to our young readers, and bring out the true and legitimate meaning of the Scriptures.

Whether this word *shual* denotes *jackal* or *fox*, in any particular

passage, must be decided by the context. Thus in Judges xv. 4, Psalm lxiii. 10, the jackal is intended. Lam. v. 18 is less certain. Neh. iv. 3, S. Sol. ii. 15, and Ezek. xiii. 4, will suit either jackal or fox: In the New Testament "fox" is right, Matt. viii. 20, Luke ix. 58, xiii. 32.

Though "jackal" does not occur in the Authorized Version, there are probably three or four other Hebrew words which denote this animal. Jackal is the meaning certainly in Job. xxx. 29, Psalm xlv. 19, Isaiah xiii. 22, xxxiv. 13, xxxv. 7, xliii. 20, Jer. ix. 11, x. 22, xiv. 6, xlix. 33, li. 37, Micah i. 8, where the Authorized Version has "dragon;" most probably in Mal. i. 3, where also the rendering is "dragon;" also in Lam. iv. 3, where we have "sea-monsters;" and in Isaiah xiii. 22, xxxiv. 14, Jer. l. 39, where we have "wild beasts of the islands." The mournful cry of the jackal is referred to in Job xxx. 29, "I am a brother to dragons;" Micah i. 8, "I will make a wailing like the dragons;" and their dwelling in desolate places, Psalm xlv. 19, Isaiah xiii. 22, xxxiv. 13, xxxv. 7, xliii. 20. The "wild beasts of the deserts" (Isaiah xliii. 21, xxxiv. 14, Jer. l. 39) must probably be understood to include various animals, especially jackals and hyænas.

Now it is clear from the Bible that the Syrian fox, to which the Bible of course refers, must have been very abundant, from the fact that whole districts and cities derived their name from the circumstance of their abounding there. Thus the land of Shual, mentioned 1 Sam. xiii. 17, means literally the land of the fox; and Hazar-shual (Josh. xv. 28, xix. 3), the name of a city, signifies the foxes' habitation. But the jackal is gregarious, whilst the fox is a solitary animal, being more abundant to the north, and very rarely seen in the warm climate of Syria. This jackal, it has been shown, resembles a fox, and therefore would naturally enough be called by that name. The abundance of the animal, and its real character, is further proved by Judges xv. 4, 5, "And Samson went and caught three hundred foxes, and took firebrands, and turned tail to tail, and put a firebrand in the midst between two tails. And when he had set the brands on fire, he let them go into the standing

corn of the Philistines, and burnt up both the shocks and also the standing corn, with the vineyards and olives." Now if it is borne in mind that the foxes captured were the fox-like animals called jackals, it will be at once seen that there would be no difficulty in effecting such a seizure. It has indeed been assumed by infidelity, for the purpose of impugning the truth of the sacred narrative, that the fox mentioned was that of colder climates; but, the objection is answered, now that it is known that the animals were jackals.

The jackal or fox of Scripture is not a vagabond, like the eastern dog, but a burrowing animal, and has a regular settled habitation. Matt. viii. 20, "The foxes have holes," etc. It would seem, too, that if he could not find a suitable hole, then a deserted habitation or some other solitary ruin would content him. Hence the pathetic language of sorrow in Lam. v. 17, 18, "For this our heart is faint, for these things our eyes are dim. Because of the mountain of Zion, which is desolate, the foxes walked upon it." Both the jackal and fox go out at night for prey, the former especially feeding greedily upon carrion and offal of every description, visiting the battle-field, and devouring the dead and the dying; and to this habit David clearly refers, when he thus prophesies concerning his enemies (Psalm lxxiii. 9, 10), "But those that seek my soul, to destroy it, shall go into the lower parts of the earth. They shall fall by the sword; they shall be a portion for foxes." In the fruit season the Syrian jackals will, during the night, seek the vineyards, like their relative, the fox, and devour the grapes, to which they are very partial; and to this practice there is evident allusion in Solomon's Song ii. 15, "Take us the foxes, the little foxes, that spoil the vines; for our vines have tender grapes." Lastly, the jackal of Palestine resembles the fox in the craftiness and cruelty of his disposition, and to this our Lord pointedly alludes, when some of the Pharisees advised Him to flee from the machinations of Herod (Luke xiii. 31, 32), "saying unto Him, Get Thee out, and depart hence; for Herod will kill Thee. And He said unto them, Go ye and tell that fox," that cruel, crafty, and ferocious

prince, "behold, I cast out devils, and I do cures to-day and to-morrow, and the third day I shall be perfected."

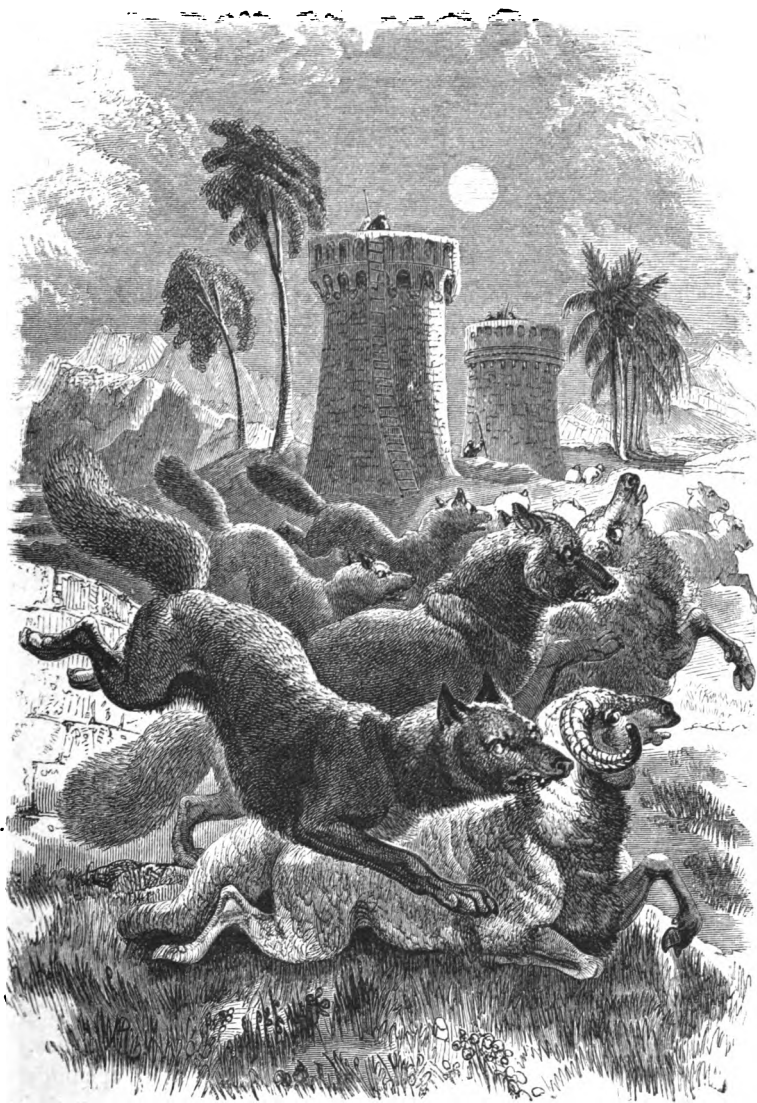
THE WOLF (*Canis lupus*, L.)

This animal, once indigenous to this country, but now exterminated, still lingers in the forests of northern and southern Europe, and is found to this day in Palestine, where it was formerly very abundant. According to Professor Bell and other distinguished naturalists, "the wolf is the original wild source from which all our domestic dogs have sprung."*

The general appearance of this animal, its robust but gaunt frame, wild and sinister appearance, swift and tireless pursuit of prey, and mingled ferocity, cruelty, cunning, and cowardice, are well known; although when brought to bay it certainly defends itself with the greatest determination. There is hardly any animal which a herd of hungry wolves will not attack, and few, however swift of foot, escape them; the buffalo and stag have both to succumb to their untiring perseverance in pursuit, and are almost invariably run down at last; and man himself, even with the aid of those deadly weapons with which science has furnished him, can sometimes barely escape them.

The dying patriarch Jacob foretold that the descendants of his youngest son Benjamin should (Gen. xlix. 27) "ravin as a wolf;" and this prediction was truly verified in that portion of his history under the judges, when the children of Benjamin not only refused to give up the men of Gibeah to justice, but espoused their cause, ravining like wolves in the blood of the "men of Israel," until they were ultimately defeated and almost exterminated, like the cruel, bloodthirsty animals whom they so faithfully represented, their tribe being brought to the very brink of destruction. (See Judges xx.) Afterwards, when the claims of justice were satisfied, the men of Gibeah put to the sword, and their city burnt with fire, "the children of Israel" mourned over the desolation of "Benjamin their brother," and did everything that was in their power to help

* Bell's "British Quadrupeds," p. 200.



Wolves attacking Sheep.

him to recover from that ruin which he had brought upon himself by his own ravining and ferocity. (Judges xxi.)

The ferocity of the wolf, its attacks upon the sheep-fold, and its habit of stealing forth in the evening in search of prey, are all referred to in the Bible. (See Isaiah xi. 6, lxv. 25; Jer. v. 6; Ezek. xxii. 27; Habak. i. 8; Zeph. iii. 3; and Acts xx. 29.) In this country, the shepherd has no anxiety about the safety of his sheep from the attack of wolves and other ferocious animals, which have been exterminated long ago; but in Palestine, where these vermin of the woods abounded, especially during the time of our Lord, every precaution had to be taken. Hence in the Bible the wolf is everywhere represented as the cruel enemy of sheep and goats, particularly in the New Testament, where the ferocity of his character and his attacks upon those animals are dwelt upon by our Lord, in His parables, and also in His sermon on the mount. (See Matt. vii. 15, x. 16; Luke x. 3; John x. 12.)

THE MUSTELIDÆ (Lat. *mustela*, a weasel).



The Weasel and the Ferret.

These two animals are both mentioned once in the Bible, being simply enumerated, amongst the creeping things forbidden as unclean, in Leviticus xi. 29, 30. They are the last of the Digitigrade carnivora named in Scripture. From their peculiar appearance and habits they have been called vermiform quadrupeds, being distinguished by the length and slenderness of their bodies, which enables them to wind like worms into very small openings and crevices, whither they easily follow the smaller mammalia

and birds on which they prey. The weasel is found very plentifully in Palestine.

It has been doubted whether the word rendered weasel does not mean mole or mole-rat ; but there is good reason for believing that weasel is correct.

Not so with ferret (*Mustela furo*). Several meanings have been assigned to the word, especially shrewmouse, hedgehog, and gecko. Some plausible arguments may be adduced for the first two, but the weight of evidence is in favour of the last. The gecko will be described under lizards.

THE HYÆNA (*Hyæna striata*.)

The hyænas are a remarkable group of animals confined to Africa and Asia, resembling dogs in the general form of their body, and approaching cats in the structure of their teeth. Their hind-legs are much bent and comparatively feeble, giving a sort of awkward shuffle to their pace. Their hind-quarters are therefore lower than their fore-quarters, which, including their neck, chest, and shoulders, are extremely powerful. Their feet are all furnished with four toes armed with strong claws, which, like those of dogs, are non-retractile, and their tongues are roughened with prickles, like those of cats.

The hyæna is a nocturnal, carrion-feeding animal, passing the day in caves or in holes which he digs in the ground with his powerful feet, and coming forth at night in search of food. He is indeed a thorough carrion feeder and a better scavenger than the lion, wolf, or jackal, which eat only the soft parts of the animals which they kill, tearing off their flesh with their fangs, and licking their bones clean with their rough tongues ; for the hyæna devours the bones themselves. His jaws and teeth are tremendously strong, and the muscles moving them so powerful, that they act like a crushing mill on the bones, and grind them to powder itself ; whilst his unparalleled digestion enables him to assimilate the hard sharp fragments which would kill any other creature.



The Hyæna.

In Palestine, where these animals are abundant, they rob the graves of their dead, and it becomes therefore necessary to protect them against their attacks; in the case of the poor, by a covering of heavy stones which are heaped up over them; and in that of the rich, by placing the body within a rock-hewn sepulchre, and closing its mouth with a heavy stone which the hyænas cannot move.

In consequence of this exceedingly offensive habit, the hyæna is utterly detested in Palestine, and destroyed by the people whenever opportunity offers.

There are only one or two passages in the Old Testament which refer to this animal. Jeremiah xii. 9, "Mine heritage is unto me as a speckled bird." Here the Hebrew word *zabua* signifies something that is streaked; but in the Septuagint we find "hyæna," an animal common in Palestine to the present day. The interpretation is not certain, but hyæna is probably the meaning. Others take it as the Authorized Version, "speckled" or parti-coloured birds, it being supposed that speckled birds are fallen upon and attacked by other birds. Again, we have the passage, 1 Sam. xiii. 18, "And another company turned to the way of the border that looketh to the valley of Zeboim toward the wilderness;" or literally, according to the Hebrew rendering, "the valley of the hyænas." See also Nehemiah xi. 34, where Zeboim is mentioned as the name of a place.

THE PLANTIGRADE CARNIVORA.

II. THE SYRIAN BEAR (*Ursus isabellinus*).

This section of the Carnivora contains the bear and the badger, the only animals belonging to it in the Bible, and which alike possess this common characteristic distinction from the other Carnivora, that the whole sole of their foot, instead of their toes only, is applied to the ground in walking.

The family of the Ursidæ, or bears, are large, heavy animals, strictly plantigrade in their walk, which is of an awkward, shuffling

nature, and manifesting great dexterity in climbing. They live in caves and in hollow trees, generally in mountainous countries, and in the depth of the forests. They can stand without difficulty on their hinder feet, and have large non-retractile claws, which are adapted for digging, and which are powerful weapons both of defence and attack. As to their diet, that depends upon the species ; thus the American black bear (*Ursus Americanus*) feeds almost exclusively



The Syrian Bear.

on roots and berries, whilst the Polar bear (*Thalassarctos maritimus*),—remarkable for having the soles of its feet covered with hair, which gives it a firm footing on the ice,—feeds upon the carcasses of dead whales, seals and fish, and even captures living seals, by watching for them when they come up at their breathing-holes. The common brown bear (*Ursus arctos*), perhaps the most widely diffused species, may be regarded as omnivorous, feeding on roots and

berries, and now and then making a meal of some of the smaller mammalia when they come in his way. Indeed, every species of bear will feed on flesh when pressed by hunger, and even destroy life to obtain it. The fondness of the American black bear for honey is well known, and Washington Irving, in his "Tour on the Prairies," introduces one of his rangers, who thus gives his



The Polar Bear.

opinion on this subject in language certainly more characteristic than elegant :—"The bear is the knowingest varmint for finding out a bee-tree in the world. They'll gnaw for days together at the trunk, till they make a hole big enough to get in their paws, and then they'll haul out honey, bees, and all."

The bear is a hermit among beasts. He loves a solitary life, shunning even the society of the female, excepting in the month of June. The she-bear is a kind and devoted mother, watching over her cubs with the tenderest care, and defending them with



Bears in the Zoological Gardens.

the most undaunted courage. In high northern latitudes, bears generally spend the winter in a state of torpor, in some natural, or perhaps artificial, excavation which they have themselves formed. Here the snow soon accumulates in a close warm covering around

them, which is to them the very best of blankets. A small hole is made by the animal's breath, and so the hunter often discovers the poor bear's retreat. In these snowy winter's homes the young bears are born. The mother-bear is generally very fat when she first takes up her winter quarters; but, having nothing to eat during her confinement, and her cubs to suckle, she generally comes out in spring, when the snow melts, as thin as a skeleton.

Notwithstanding his ferocity, the bear can be tamed and taught to dance, and his rude appearance and grotesque attitude make him a general favourite with young people. The bears referred to in the cut are those which are kept in the Zoological Gardens, Regent's Park, London.

As to the bears of the Bible, there is no difficulty whatever this time in determining the species to be the Syrian bear. (See page 48.) This animal is first mentioned in 1 Sam. xvii. 34—37, where David relates to Saul the circumstance that he killed a lion and a bear, which had taken a lamb out of his father's flock, bringing it back to the fold uninjured, as a reason for his accepting the challenge of Goliath; and (2 Kings ii. 23, 24) we read of children mocking the prophet Elisha, who were torn by two she-bears that "came forth out of the wood." (See also Isaiah xi. 7, and lix. 11; Lam. iii. 10; Dan. vii. 5; and Rev. xiii. 2.)

The maternal tenderness of the bear for her young, and her rage and grief when "bereaved" of them, is several times referred to in the Scriptures. See 2 Sam. xvii. 8; Prov. xvii. 12; and, lastly, Hos. xiii. 8, "I will meet them as a bear that is deprived of her whelps, and I will rend the caul of their heart." There is also reference to the great strength and ferocity of the bear. Thus, in Prov. xxviii. 15, "a wicked ruler over poor people" is compared to "a roaring lion and a ranging bear;" and the ferocity of the two animals is represented as about the same in Amos v. 19, "As if a man did flee from a lion, and a bear met him," or escaping from one danger, fell the next moment into another equally great.

THE BADGER (*Meles Taxus*).

The common badger is found in most parts of Europe. It is a heavy, slow animal, passing the day asleep in its burrow, and only coming forth at night to feed indifferently on animal and vegetable matter—earth-nuts, fruits, insects, frogs, and the eggs of birds.



Badgers.

Its feet are plantigrade, and furnished with long claws for digging with effect, and burrowing in the woods. Its bite is proverbially powerful, and its muscular strength very great. A badger-baiting was formerly a cruel but very popular amusement with our rustic population. The excitement was much increased by the fact that the animal's coat is very loose, and of a hard, leathery texture, so

that when the dogs get a hold on it, the badger is able to turn and bite with the greatest ease ; now as the animal was put into a tub or barrel, and the dogs were thus compelled to attack in front, it may be easily imagined how severely they suffered.

About 5000 skins of the American badger (*Meles Labradoricus*) are annually sent over to this country by the Hudson's Bay Company. It might indeed appear from the Bible that the skin of this animal has been useful to mankind almost from time immemorial. For as early as the book of Exodus we read (xxvi. 14) of "rams' skins dyed red, and a covering above of badgers' skins;" and in several other places the same words are used in reference to the covering of the tabernacle and its furniture; see Exod. xxv. 5, xxxv. 7, 23, xxxvi. 19, xxxix. 34; Num. iv. 6, etc. It is very unlikely, however, that 'badger' is the real meaning of the Hebrew word. Some have even supposed that no animal whatever is intended, but only a particular *colour*; but in all probability this is a mistake. There is little doubt that the skin used for the covering of the tabernacle was that of some marine animal, the seal, or the dugong, or the porpoise. In Ezek. xvi. 10, the same kind of skin is spoken of as used for shoes.

III. THE PINNIGRADE CARNIVORA.

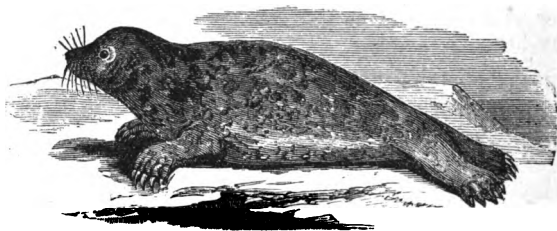
THE COMMON SEAL (*Phoca vitulina*, L.), and THE MONK SEAL (*Phoca monachus*).

This group includes the two families of the seals and walruses, only the former being referred to in the Scriptures. The seal is for the most part confined to the extreme northern and southern parts of the world, where it is especially abundant; but there are several species of these animals, which are found in nearly every climate excepting the tropics. Of the northern species,

THE COMMON SEAL (*Phoca vitulina*, L.), found on the Scotch, Welsh, and Irish coast, and in immense numbers on those of Greenland and Labrador, appears to have been the one most known to the ancients, as it is the most universally spread; the

other and rarer species is confined to particular localities. The general habits of all are, however, nearly the same, the Monk Seal included, the probable seal of the Bible, in which we are most interested.

The common seal is a curious marine animal, resembling a quadruped in some respects, and in others a fish, whose appearance doubtless gave rise to those fabulous marine stories of our ancestors about mermaids, or creatures half fish and half woman. The head is round, and the nose, which is broad, resembles that of a dog, with the same look of intelligence and mild expressive physiognomy. The lips are thick and prominent, and furnished with long stiff whiskers, and the eyes are large, black, and sparkling. The common seal has no external ears, but a valve exists at the orifices, which can be closed at will, so as to keep out the



The Common Seal (*Phoca vitulina*).

water; the nostrils have a similar valve. An external ear is only present in the genus OTARIA (from Greek *otaros*, having ears), a species which inhabits the Southern Ocean. The form of the teeth and jaws of seals shows them to be carnivorous, their food consisting of fish, crabs, and sea-birds, which they are enabled to surprise while swimming.

The entire organic structure of the seal is beautifully adapted to its life in the water, in which it swims with the greatest ease and rapidity. The body is elongated and conical, gradually tapering from the shoulders to the tail. The limbs are very short, and are used by the animal as oars and paddles, the arm and

forearm being so abbreviated, like that of the mole, that little more than the paw projects from the body, which consists of five fingers, with flat curved nails, covered with membrane. The hinder limbs are flattened and directed backwards, so as almost to seem like a continuation of the body; the thigh and leg are very short, and the hinder are formed on the same plan as the fore-limbs, the toes being in contact, however, and the web folded when it is not in use as a paddle, but spread out horizontally when the animal is swimming. Between these paddles is the short and compressed tail.

The common seal is from three to five feet in length, and is of a yellowish-grey colour, with brown and blackish spots on the head and upper surface. The skin secretes a fatty matter, which renders the hair more glossy, and protects the body from the water, a thick layer of fat being disposed over the whole body. The spine is provided with strong muscles, which render it very flexible, help its awkward movements on land, and greatly add to the elegance and facility of its motions in the water. On shore or on masses of ice, as might be expected from the structure of their feet, the movements of the seal are anything but elegant. They travel by lifting themselves up from the ground or ice on their fore-limbs, and holding on by their fore-paws, whilst they arch the back strongly upwards, thus drawing forward their hind-feet or flippers; the latter then form the point of support, and the head and fore-paws are pushed forward by the mere straightening of the body; a mode of progression, in fact, resembling that of a Surveyor or Looper caterpillar, and therefore necessarily very slow and laborious.

These animals, therefore, seldom venture far from the shore, but usually climb upon low rocks or masses of ice near the coast, where they are exceedingly fond of lying in herds, basking in the sun, and where they bring forth and suckle their young, generally two or three at a time, exhibiting the most tender solicitude for their welfare. Whilst thus engaged, they have sentinels always on the watch, who alarm the herd on the approach of danger,

when all take to the water, into which they immediately plunge for safety.

We have entered into these particulars about the common seal as introductory to the study of the species in which the Biblical student is most deeply interested, viz. :

The Monk Seal, or *PHOCA MONACHUS*, *Herm.*, a species which occurs in the Mediterranean, and is restricted to the coast of Africa. It is therefore the species nearest the coast of Palestine, the one best known to the Jews, must have been known to the Hebrew legislator, and is therefore the species to which the Scriptures most probably refer. The monk seal is mentioned as existing in the Mediterranean, in the works of Aristotle, in Shaw's Zoology, and has been minutely described by Hermann in the fourth volume of the Berlin Transactions. It has the same general habits and organisation as the common seal (*Phoca vitulina*, L.), although differing from that species in the following important particulars. The monk seal has been so named from the looseness or the width of the skin behind its neck, which, when the animal is placed on its back, folds like a monk's cowl. It is much larger than the common seal, growing to the length of more than ten feet. The head is smaller and the neck longer than that of the common seal, and the orifice of the ears not larger than a pea. The monk seal has four cutting-teeth in each jaw, associated with pointed canines and trenchant or cutting-molars, with their crowns compressed laterally, and their edges usually more or less notched and pointed. The lips are thick and prominent, covered with dark whiskers or vibrissæ. The eyes are large, black, and sparkling; the general expression and appearance of the face resembling that of a mild, intelligent dog. The hair is short and rough; its colour black on the upper, and ash-grey on the under surface of the body. The fingers on the fore-paws have nails, but the toes on the hind-feet or flippers are pinnatifid, or resemble fins, and have no nails.

The monk seal spends the greater part of its life in the water, never landing except to breed or bask in the sun. These animals

have the same gregarious habits as the common seal, and delight in lying along the shore to sun themselves, or on the surface of rocks in the neighbourhood of the sea, resorting in winter to their deepest recesses and caverns as a breeding-place. Their voice, like that of the common seal, resembles the bark of a dog, and is heard usually in the evening, or on the approach of a change of weather.

ORDER IV. CETACEA, OR WHALES.

This order is divided into three groups or families.

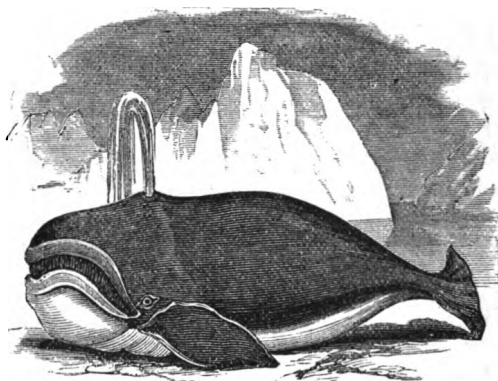
I. The True Whales, *Balænidæ* (Lat. *Balæna*, a whale), without teeth, and having the mouth furnished with plates of whalebone or baleen. This family is well represented in the Common Whale, etc.

THE COMMON WHALE (*Balæna mysticetus*),

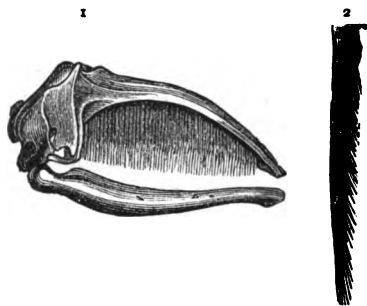
Although provided with an immense mouth, has an œsophagus or food-pipe so small that he is compelled to nourish his vast bulk on some of the smallest marine animals, such as minute crustacea, mollusca and medusæ, or jelly fishes. In order to secure these insignificant morsels, his mouth has been provided with an efficient strainer, which consists of numerous parallel laminæ of whalebone or baleen, which descend from its palate or roof. In feeding, "he engulphs a whole shoal of them at once in his capacious jaws, where they are of course entangled among the fibres of the baleen; the water is then strained off and expelled through the blow-holes, and the monster is thus enabled to pass his diminutive prey at his leisure into his stomach."

The whale is not a fish, as is commonly supposed. Fish are oviparous, or develop from eggs which are deposited in the water, and there fertilized; whales are viviparous, or bring forth their young alive, which they suckle for some time afterwards. They are therefore true mammalia, and as such naturalists have classified them. The tail of a fish is vertical, of a whale horizontal. By the vertical tail the fish steers at the same depth in any

direction, rising and falling in the water by means of their swimming bladder; the whale, on the contrary, must come to the surface for its supply of air, and from immense depths, where the pressure of the water is enormous; to the whale has therefore been given



The Common Greenland Whale (*Balena mysticetus*).



1. Skull of Whalebone Whale, showing the baleen, or whalebone, descending from the palate, or roof of the mouth.
2. A single plate of baleen.

a horizontal tail, which acts as an oar of inconceivable power in overcoming the weight of the water, and bringing it upwards. The tail of a large whale measures about twenty or twenty-five feet in breadth, and five or six feet in length. Not only the direction of

the tail helps the whale to overcome this tremendous superincumbent pressure, but the blubber does the same thing ; for it is as elastic as india-rubber, and at the same time protects the animal against that fearful cold which prevails in the Arctic seas. Hence the blubber has been very appropriately called by the whalers the blanket.

The whale frequents the frozen seas within the Arctic circle, and is at home among its floating icebergs. As the Greenland whale is very valuable commercially for its whalebone, and also for the oil contained in its blubber, it is therefore an object of eager pursuit to seamen, who willingly expose themselves to the rigours of an Arctic winter, and to shipwreck in its most frightful forms, the hardy harpooner not unfrequently perishing through the upsetting of his boat, owing to the violent plunges which the wounded animal makes in the water.

The word whale occurs in our Bibles in four passages, Gen. i. 21, Job vii. 12, Ezek. xxxii. 2, and Matt. xii. 40. In the third of these passages (Ezek. xxxii. 2) the crocodile is intended. In all other places the sacred writers use the word as a general term for any large fish (the word "fish" being taken in its popular sense, as including all inhabitants of the seas). Thus, whereas in Matt. xii. 40 we read, "For as Jonas was three days and three nights in the whale's belly, so shall the Son of man be three days and three nights in the heart of the earth ;" the statement of the book of Jonah (i. 17) is that "The Lord had prepared a *great fish* to swallow up Jonah." That such a miracle took place is certain, for our Lord Himself referred to it as the type of His own resurrection, and the two miracles must therefore stand or fall together. But the exact nature of the "great fish" must remain uncertain.

In some passages in which we find "dragon" in our authorized version (Psalm lxxiv. 13, cxlviii. 7, and perhaps Isaiah xxvii. 1), the word really signifies a large fish (whale, grampus, dolphin, etc.). Leviathan also, which properly denotes a crocodile, has the same meaning in Psalm lxxiv. 14, civ. 26.

"Whirlpool" in the margin of Job xli. 1, was probably meant to denote a large fish, perhaps "sperm whale."

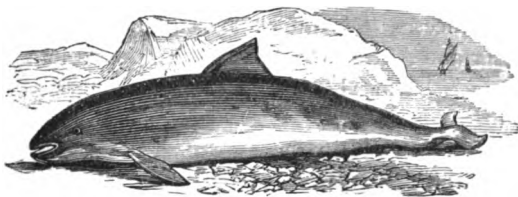
II. THE SPERM WHALES (*Physeteridae*, Gr. *phuseter*, a wind instrument), alluding to the enormous apparently inflated head of the animal. Without baleen plates, and having from forty to fifty conical teeth in the lower jaw, which fit into corresponding cavities in the upper, so that the mouth is capable of being completely closed.

The Sperm Whale, or Cachelot (*Physeter macrocephalus*). This species, which measures from seventy to eighty feet in length, has a head of enormous size, forming about one-third of the entire length of the animal, and is very generally distributed in all seas, but principally in those of the southern hemisphere. It inhabits deep water, very rarely approaching the land, its food consisting chiefly of cuttle-fishes, which are abundant in the southern seas. These whales are much valued for their blubber, which produces the finest of animal oils, chiefly used for burning in lamps. The oily matter obtained from the head hardens by exposure to the air, and is then known as spermaceti, which is very valuable as an ointment and for the manufacture of candles. A perfume called ambergris, of still greater value, worth a guinea an ounce, is also obtained from the sperm whale. It is a morbid secretion of the intestines, and is rarely looked for there by the whalers; but usually found floating out at sea in masses of considerable size, sometimes weighing thirty or forty pounds, and probably disengaged from the decomposing body of one of these monsters.

III. THE DOLPHINS, *Delphinidae* (Lat. *dolphinus*, a dolphin), Cetacea far inferior in size to the gigantic mammalia of the previous families, having the same horizontal tail, but with the form of the body more regularly fish-like, and the jaws armed with numerous conical teeth. This family contains numerous species found all over the world. The ancients were well acquainted with them. The commonest is

THE PORPOISE (*Phocæna communis*), which is found in all the

seas of Europe, in the Atlantic, and in the Mediterranean ; in fact, so common is it in British waters, that it is almost impossible for any one to spend a few days at the sea-side without seeing them. Their length is from four to eight feet, and when in the water they very much resemble large black pigs, whence they are frequently called sea-hogs or hog-fish. Porpoises feed on small fish, such as herrings and mackerel, which they destroy in great numbers. Their colour in the water is a bluish black



The Porpoise (*Phocaena communis*).

above, and nearly white beneath. Their back fins are in form triangular, and placed nearly upright. The spiracle, or spout-hole, is upon the crown of the head. Porpoises appear to find great pleasure in swimming in shoals in the neighbourhood of ships, and following in their wake, when their gambols with each other often afford considerable amusement to the passengers.

ORDER V. RUMINANTIA, OR RUMINATING ANIMALS.

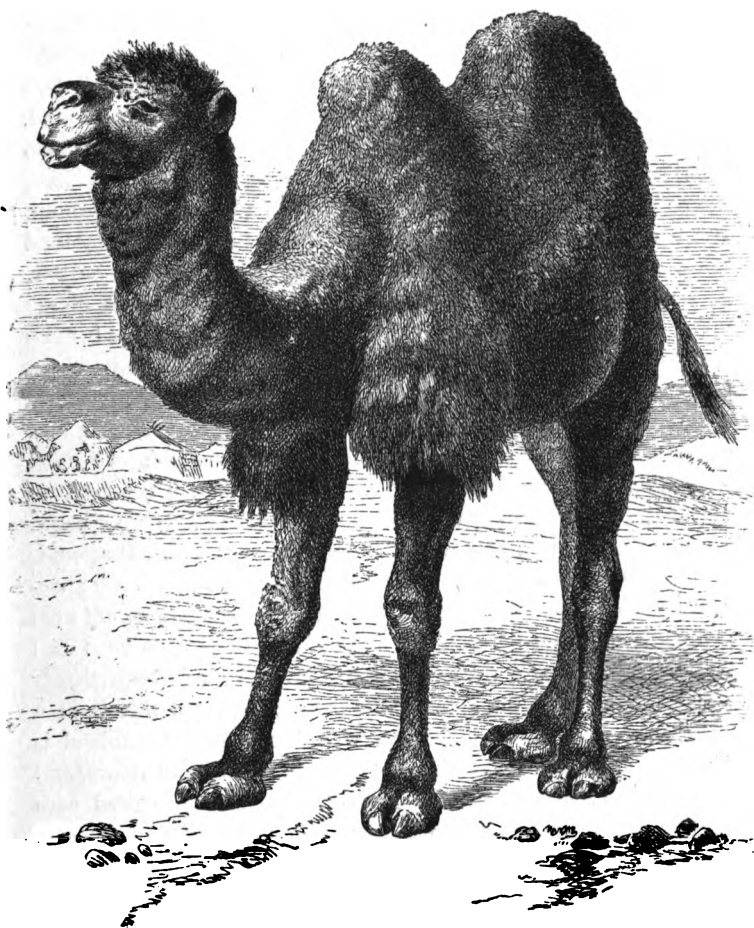
THE CAMEL (*Camelus dromedarius*, L.)

The camel belongs to the natural order Ruminantia (Lat., *ruminare*, to chew the cud), or that group of the mammalia which have the very remarkable habit of ruminating or chewing their food over again. All the animals of this order are herbivorous or vegetarians in their diet, possessing cloven hoofs, and only incisor and molar teeth for cutting and grinding their food ; indeed, the order itself appears to have been expressly created for the use of man, and hence the animals composing it accompany him wherever he

is found, furnishing him with a very considerable proportion of his food and clothing. In the colder parts of the northern hemisphere the order Ruminantia is represented by the ox, sheep, goat, and deer; whilst in the warmer parts, lying near the equator, the antelope, giraffe, camel, and dromedary are its chief representatives.

There are two varieties of camel in the old world, the Arabian camel, or dromedary (*Camelus dromedarius*), with a single hump, and the Bactrian camel (*Camelus Bactrianus*), having two of these excrescences. The camel is distributed over the warmer parts of Asia and Africa, where it is never found in a wild state, the whole race having been from time immemorial under subjection to man.

It is difficult to conceive how the affairs of mankind could be carried on, in the regions inhabited by camels, without their assistance. To a very considerable extent the inhabited and settled parts of eastern countries are separated by deserts extending for hundreds of miles, with only here and there a few prickly bean-caper shrubs (*Zygophyllum*), and hardly a blade of grass to relieve the eye—nothing but barren rocks and burning sands—intervals therefore as impassable as though the sea rolled its waves between them. Some special means must be provided, and, accordingly, an animal is found there which answers every purpose, the camel, well named by the Arabs the “ship of the desert,” as no other animal can cross these wastes, and live. He alone possesses those powers of endurance necessary for such a journey. The coarse prickly shrubs growing there are to him the most delicious food, and even of these he eats but little. There is great scarcity of water in the desert, and he can travel several days without it; because, when he has a chance of quenching his thirst, he always provides for such emergencies by storing away a quantity in his stomach. He thus carries his own spring when travelling in countries without one, from which he draws at pleasure as much as he requires. The foot of the camel is broad and cushion-like, beautifully formed so as to ensure him ease and comfort in his



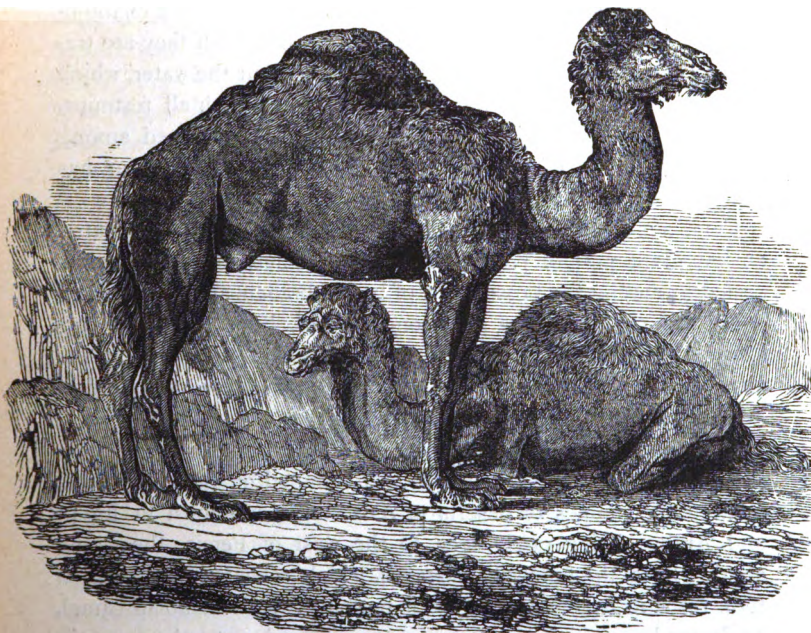
The Bactrian Camel.

tread ; he is thus enabled to walk without fatigue over the yielding sands and hard gravelly soils of the desert, even when heavily loaded. The load of the camel varies from 600 to 1000 lb., according to his strength and the distance which he has to go. These animals are taught from infancy to kneel down to receive their load or their rider, and consequently the joints of their legs and their breast, by coming into frequent contact with the ground, acquire in course of time remarkable callosities. Kneeling is also their natural posture when in a state of repose, their legs being flexed beneath the body, and their breasts resting upon the ground. When overloaded, the camel testifies against the injustice by loud cries, and obstinately refuses to rise, even when severely beaten. It would seem that the poor animal does not find much mercy under such circumstances ; that he is frequently treated most inhumanly by his driver ; and that heavy galling loads and meagre fare are most frequently his appointed portion.

But even the fare of the desert, scanty as it is, may fail ; and when this is the case, the hump, which strikes the eye as a deformity, becomes very valuable. It is, in fact, a reservoir of nutriment, and its fatty mass is gradually absorbed into the system, which thus receives the nourishment which is denied around. When the hump disappears, rest and plenty of good food are absolutely necessary to restore it to its former size, which does not take place till the other parts of the body of the camel have been well replenished. Before commencing a journey, therefore, particular attention is paid to the state of the hump ; for, until this is in a satisfactory state, the camel-driver well knows that the animal is not in good travelling condition. When in harbour, therefore, and undergoing repairs, this living Arab ship is liberally stored with food, and brought again into sailing order as speedily as possible. The camel is daily fed with balls of barley-meal mixed with powdered dates, made into a sort of paste, which food, even after the voyage is resumed, is also given at every halting-place, so long as the supply lasts.

The above description is applicable chiefly to the Bactrian camel

(*Camelus Bactrianus*), spread through Central Asia, Thibet, Persia, and the warmer parts of China. This camel is a beast of burden, for as such it has been found most valuable. It is slow in its movements, travelling at the rate of two and a half miles per hour, and is larger and stronger than the Arabian variety, the *Camelus dromedarius*, or dromedary, which moves faster and is much slen-



The Dromedary.

derer in its general structure ; in a word, the two differ quite as much from each other, as a high-bred English hunter differs from a low-bred cart-horse.

Much of what has been said about the camel is equally true in reference to the dromedary. These two varieties of the camel agree in having beetling brows overarching their large dark eyes, with

long-lashed eyelids to defend the organ against the glare of the burning sun of the desert ; also in their nostrils, which are constructed so as to exclude as much as possible the particles of desert sand driven by the wind. The opening into the nostrils resembles a slit, which is capable of being closed tightly, like the lid of a box, or opened so as to admit slightly the small amount of air necessary for healthy respiration. Both animals carry their heads high, and have an acute sense both of sight and smell, the former enabling them to see the green oasis in the sea of sand which they are traversing at a surprising distance, the latter to scent the water, which so soon as they do, they immediately break through all restraint, and rush forward to drink. These animals are indeed among the most valuable of those gifts which the bountiful Creator has bestowed on Oriental nations.

Camels are frequently mentioned in the Bible. They constituted an important part of patriarchal wealth. Thus, camels are mentioned as among the possessions of both Abraham and Jacob. Job had 3,000 camels before affliction overtook him, and afterwards 6,000 of these valuable animals, on the return of prosperity at the termination of his trial ; and to this day riches are estimated in Arabia, amongst other things, by the number of camels.

Camels are mentioned as used in travelling, both for riding upon and as beasts of burden. As the two-humped or Bactrian camel inhabits the steppes or deserts of Asia, and is unknown in Egypt and Arabia, being rarely seen to the west of Persia, the camel alluded to in the following passages, which refer to events which took place in Arabia and Egypt, is undoubtedly the Arabian camel, or dromedary, which in those countries is used, not only as a swift riding camel, but as a beast of burden, the more muscular variety being chosen and specially trained with the latter object in view. The swift variety of dromedary is alluded to in 1 Samuel xxx. 17, where we read that David smote the Amalekites, "not a man of them" escaping, "save four hundred young men, which rode upon camels, and fled." It is not improbable that the same variety of riding dromedary was used by Abraham's servant, whom Abraham sent

to his brother Nahor, with camels loaded with suitable wedding presents for Rebekah, and camels' furniture. In Genesis xxiv. 10-67, we have a very interesting account of the camel, the negotiations, and the humility, industry, and courtesy of Rebekah, a young woman of rank and fortune, who drew water not only for Abraham's servant, but for his tired and thirsty camels. For "the servant ran to meet her, and said, Let me, I pray thee, drink a little water of thy pitcher ; and she said, Drink, my lord ; and she hastened and let down her pitcher upon her hand, and gave him drink : and when she had done giving him drink, she said, I will draw water for thy camels also, until they have done drinking. And she hastened, and emptied her pitcher into the trough, and ran again unto the well to draw water, and drew for all his camels " (v. 17-20). Her good conduct did not go unrewarded. A few days after, she rode on the back of one of the camels, most probably a dromedary, to become the wife of Abraham's son, and one of the line of illustrious mothers from whom our Lord ultimately descended.

Again, the dromedary, or Arabian camel, was doubtless used in those ancient times, as it undoubtedly is at the present day, as a beast of burden ; we mean the camel with the single hump (*Camelus dromedarius*), which lives chiefly in the country of the date-palms, and is very useful now as a carrier of merchandise between Egypt, Arabia, Turkey, and the Barbary States. Thus, the Ishmaelitish merchants, to whom Joseph was sold as a slave by his brethren at the suggestion of Judah, undoubtedly used the camel of Arabia, the dromedary, as a beast of burden ; for they " came from Gilead with their camels bearing spicery and balm and myrrh, going to carry it down to Egypt " (Gen. xxxvii. 25). So also when the Queen of Sheba visited Solomon, with camels that bear spices, and very much gold and precious stones, as a present for the king (1 Kings x. 2).

The hump of the camel is alluded to in the prophetic Scriptures in the following passage: "They will carry their riches upon the shoulders of young asses, and their treasures upon the

bunches of camels, to a people that shall not profit them" (Isa. xxx. 6).

But it is not merely as a beast of burden that the camel is valuable in oriental countries. His flesh is eaten, and the hump on his back is esteemed a great delicacy. His hair, which is long and soft, falls off in large flakes every season, and is woven into a sort of cloth, which is said to be waterproof, and is used as an article of clothing. Raiment of camels' hair was worn by Elijah the Tishbite (2 Kings i. 8, and Zech. xiii. 4), also by John the Baptist (Matt. iii. 4). Camels' milk is used by the Arabs for ordinary purposes, that of their goats and sheep being generally made into butter. Flour made into paste with sour camels' milk is a common dish among the Bedouins, and rice and flour boiled with sweet camels' milk is another. Even the dung of the camel is valuable. It is used for fuel in the desert, when wood is scarce, and is burnt largely in all the towns and cities throughout Egypt, Arabia, and Persia. From the smoke and soot thus produced, sal-ammoniac is obtained. Formerly this substance was procured almost exclusively from this source.

The camels are the largest of all the Ruminants, some of them measuring from eight to ten feet in length, and from six to seven feet in height. The hair varies in colour, from a reddish or pale brown to a dark grey. The Nubian camels are usually white. In Egypt, the average price of a camel is from 30 to 50 dollars, but some of the swift and highly bred varieties are much more valuable, and sell at a higher rate. An instance is mentioned in which 300 dollars were paid for one of the swift Osman camels.

The more carefully the natural history of the camel and other animals mentioned in the Scriptures is studied, so much the more is the accuracy and truth of the biblical delineations of these animals, as to their habits and character, confirmed. All the statements in the Bible, when carefully and intelligently examined, are thus ascertained to harmonise with the facts upon which the best naturalists are now agreed.

Camel occurs more than fifty times in the Old Testament as a

rendering of one word (*gamaʿ*), and twice in Esther viii. 10, 14, as a rendering of an entirely different word. In these last instances "camels" is not the meaning, but either messengers or (more probably) a fine breed of mules. In the New Testament, besides the passages quoted above, the camel is referred to in Matt. xix. 24, xxiii. 24, Mark x. 25, Luke xviii. 25, each time in a proverbial saying.

The word dromedary occurs four times in the Authorized Version, representing each time a different word: (1) Isa. lx. 6; (2) Jerem. ii. 23. In each of these passages it is doubtful whether the meaning is dromedary, *i.e.* a superior breed of camels, or young camel. (3) 1 Kings iv. 28, where the word really means a swift horse. (4) Esther viii. 10, where the words rendered "young dromedaries," literally mean "sons of mares." In Isa. lvi. 20, by "swift beasts" we are probably to understand "dromedaries," though a different word is used.

THE OX (*Bos Taurus*, L.)

The family Bovidae, belonging to this order (Lat. *bos*, an ox) includes most of the domestic animals mentioned in the Bible, as cattle, sheep, and goats. The horns of these animals, which are simply processes of the frontal bone, are hollow, and permanently attached to the forehead; and in this respect they differ from those of the stag, which are solid, and shed annually. These ruminants, however, agree with the stag in their dentition; in the absence of incisor teeth from the upper jaw, the hardened gum supplying its place, against which the lower incisors of each press; and in the presence of only six molar teeth on either side jaw, the surface of which is covered with a hard substance called enamel, which lies in crescent-shaped ridges, so that these molars (Lat. *mola*, a mill) are well adapted for grinding and tritulating the herbage which the animal gathers when standing on its feet and grazing, when it lies down to ruminate. These animals are strictly herbivorous, living together in flocks more or less numerous, and are distributed over both hemispheres.

The Ox (*Bos taurus*, L.) belongs to the natural order Ruminantia, or ruminating animals (Lat. *ruminare*, to chew the cud), and includes the ox, sheep, and goat of temperate, and the camel and dromedary of tropical countries. Besides the common ox, the zebu, or Indian ox, and the yak, or grunting ox of the Himalayas, are both domesticated; but some of the closely allied species, as the bison of America and the buffalo of Africa, are hopelessly wild.

The ox has been under subjection to man almost from time immemorial. The original wild stock from which the animal descended is certainly unknown to naturalists. Its domestication must have taken place before the time of Abraham, as we find herds of oxen enumerated as among the possessions of Abraham. (Gen. xii. 16, and xx. 14.)

In Eastern countries, in patriarchal times, and from that period until now, oxen have been employed for agricultural purposes. Agriculture is still in a very primæval condition, and has remained unaltered for 2000 years, in Persia, Egypt, Greece, and Syria, or the Holy Land. The Israelites used no flail, the feet of oxen being employed to separate the chaff from the cereal grains; hence that Mosaic law originated which insures to these animals food and kind treatment whilst thus employed (Deut. xxv. 4), "Thou shalt not muzzle the ox when he treadeth out the corn." The use of oxen for this purpose has been very general in all ages, as it now is in Syria, Spanish America, and even in Portugal. The practice of employing oxen to trample over the wet ground in which grain had been previously scattered is also alluded to in Isaiah xxxii. 20, "Blessed are ye that sow beside all waters, that send forth thither the feet of the ox and the ass," and still prevails in parts of Hindostan, and in Timoor, one of the Dutch colonies in the East Indian Archipelago.

The ploughs of the primæval ages were little more than mere scratching instruments. This is proved by the monuments of Egypt, on which they have been drawn and sculptured. At a later period the plough appears to have been improved by the

addition of both a share and coulter, which was a very considerable step towards an efficient machine (1 Sam. xiii. 20). That this plough was drawn by oxen is proved by 1 Kings xix. 19 and Job i. 14. Two oxen yoked together were generally harnessed to the plough, the driver having in his hand an ox-goad, which consisted of a "long stick sharpened at one end for driving the cattle, and having at the other a kind of spade for cleansing the plough." —*Rae Wilson's Travels in the Holy Land.*



Threshing with Oxen.

The ox is one of the most useful of our domestic animals. The species has become almost universally diffused, and the varieties are very numerous. Several breeds or races exist, as those of Devonshire, Gloucester, Hereford, and Sussex; differing from each

other, not only in stature, but also in the proportions of the several parts of the body.

In Switzerland there is an excellent breed of cattle, and in no country are these animals more carefully tended or held in greater esteem for their utility. In winter they live in the sheltered vales at the foot of the mountains, which they leave in spring, ascending their slopes gradually, as the snow is removed from them by the sun, and the heat calls forth vegetation. In autumn they slowly descend, as the cold weather increases and pasturage fails them, to their winter's home in the valleys. The Swiss cows are very active, fond of gambols, and full of spirit, and will frequently follow visitors to these mountains from rock to rock, merely to observe their proceedings. The bulls look fierce enough, but they never make any attack. Almost every cow in Switzerland has a bell about her neck, and the finest cow in the herd wears the largest bell. She generally takes the lead, and appears to be quite conscious of the distinction conferred upon her; for, if deprived of her bell, she manifests her sense of the degradation by lowing incessantly and refusing food. The herd are sometimes adorned with a set of bells, which sound in harmony or make musical chords; the effect thus produced is very pleasing. This Alpine music, wild and irregular as that of the Æolian harp, is called in Switzerland the "*Ranz des Vaches*," literally "cow-rows," in allusion to the manner in which the cows walk home to their shelter for the night, along the mountain path at milking-time.

It is not necessary to dwell upon the words rendered in the Authorized Version bull, cow, ox, kine, bullock, calf, heifer, beeve. It should be mentioned, however, that the word "cattle" is not unfrequently used in the Authorized Version when the reference is to sheep or goats; for example, Gen. xxxi. 41; Ezek. xxxiv. 20. Of course, "great cattle" (Ecc. ii. 7) denotes "horned cattle."

In Gen. xlix. 6, the margin is correct; and for "they digged down a wall" we ought to read "they houghed oxen," meaning, they hamstrung or disabled oxen.

A Hebrew word which means "strong" (*abbir*) is sometimes

used to denote horses (Jer. viii. 16, xlvii. 3); sometimes bulls (Ps. xxii. 12, l. 13, lxviii. 30; Isa. xxxiv. 7). Sometimes it is difficult to know which is meant, as in Jer. l. 11, where the margin seems to be "neigh as steeds."

The words "wild ox," "wild bull," which occur in Deut. xiv. 5, and Isaiah li. 20, most probably denote a large antelope, the *Oryx* (*Antelope leucoryx*); pygarg (Deut. xiv. 5) is some kind of antelope, perhaps *Antelope addax*.



Addax (*Oryx nasomaculata*).

The Addax antelope (*Oryx nasomaculata*, Gr. *orux*, an oryx, and Lat. *nasus*, the nose, *maculata*, spotted). This is a large antelope, belonging to the Bovine type of these animals, inhabiting the sandy plains of Northern Africa, where it lives in numerous hordes. The horns are long, spirally twisted, and tapering to a point. It is rather a heavily made animal. Its neck and throat are covered with shaggy hair, and its hoofs possess remarkable breadth, so that it is able to pass more easily over the fine loose sand.

There has been much written respecting the unicorn of the Old Testament, but there is little doubt that the word denotes not any one-horned animal, but the great wild ox, the urus, or *Bos primigenius*. The word occurs in Numbers xxiii. 22, xxiv. 8; Deut. xxxiii. 17 (where the true translation is "the horns of a unicorn"); Job xxxix. 9, 10; Psalms xxii. 21, xxix. 6, xcii. 10; Isaiah xxxiv. 7.

There is no doubt that long before the historical era, there existed in the forests of ancient Europe, and even in those of Great Britain, an animal closely allied to the Urus or Aurochs of



European Bison (*Bos Bison*, L.)

history, but differing in the form of its skull (*Bos primigenius*, Cuv.), now extinct, whose fossil remains have been found in the superficial beds of certain districts. This extinct animal, Cuvier thinks, must have been the original of our domestic ox and the ancient stock from whence our wild cattle have descended. This is rendered not improbable, from the fact that the Urus or Aurochs (*Bos Bison*, L.), or European Bison of Linnæus, a species which has never been brought under the yoke, is now fast verging

to extinction, and only exists to-day in the marshy forests of Poland, the Carpathian mountains, Lithuania, and the Caucasus in a wild state, in consequence of the strict orders of the present Emperor of Russia, who will not allow any to be shot in his dominions. This same imperial potentate has also presented a fine stuffed specimen and skeleton of one of these interesting animals to the national collection at the British Museum, which is still to be seen there.

THE COMMON SHEEP (*Ovis Aries*).

This well-known animal has undergone so many changes in consequence of its domestication, that it is difficult to say which is the original stock from which it was derived. It is generally supposed amongst naturalists that it is represented by the Moufflon (*Ovis musimon*), a wild sheep which inhabits the mountains of Sardinia, Corsica, Greece, Barbary, and Asia Minor. This animal has a very short and coarse fleece, more like hair than wool. When domesticated, the rank hair disappears, and the soft wool around the hair-roots, which is hardly visible in the wild animal, becomes singularly developed. If sheep are left to themselves on downs and moors, there is a tendency to the formation of this hair amongst the wool; its occurrence in the fleece of domestic sheep is therefore rare, and when found, it is always regarded as a proof of defective sheep farming.

The sheep is capable of living in and adapting itself to almost any climate, but appears to thrive best in temperate regions—at least it is here that its wool and flesh, its two most important products, arrive at their greatest perfection. In Australia, where the climate is temperate, the sheep thrive wonderfully, and produce the finest wool in the world; but in tropical climates the wool of the sheep degenerates into hair, and the animal, in the course of a few generations, is hardly to be recognised as belonging to the same species. Thus some of our finest South Down sheep were imported into the West India Islands. In two years they had become quite

lean, and their thick woolly fleece had been replaced by a covering of short, crisp, brownish hair. The nature of the sheep readily adapts itself by an increase or decrease in its formation of fat, and also a change in its covering, to a warm or a cold climate, hence its extensive geographical diffusion over the earth's surface.



The Common Sheep.

The domestication of the sheep, according to the Scriptures, was almost coeval with the commencement of the human race: (Gen. iv. 2,) "Abel was a keeper of sheep." There is also abundant proof, not only in the Bible, but in other ancient books, that in patriarchal ages a great part of the riches of individuals consisted in flocks of sheep; and in certain parts of the old world, as

Central Asia, Syria, and Arabia, where droughts prevail for some portions of the year, converting plains into deserts, and rendering them unfit for culture, the nomadic or pastoral state of society still exists. It is in such countries, where the ancient habits of Eastern shepherds are still continued, that we obtain the most pleasing and instructive illustrations of the meaning and truth of the Scriptures.

In his work on "Abyssinia," Sir S. Baker thus describes the life of the modern Arabian shepherd :—

"The Arabs are creatures of necessity ; their wandering life is compulsory, as the existence of their flocks and herds depends upon the pasturage. The Arab cannot halt in one spot longer than the pasturage will support his flock. The object of his life being fodder, with the change of the seasons he must change his localities, and must wander in search of the ever-changing supply. His wants must be few, as the constant change of encampment necessitates the transport of all his household goods ; thus he reduces to a minimum his domestic furniture and utensils. With the Bible in one's hand, and these unchanged tribes before the eyes, there is a thrilling illustration of the sacred record ; the past becomes the present ; the veil of 3000 years is raised, and the living picture is a witness to the exactness of the historical description. At the same time, there is a light thrown upon many obscure passages in the Old Testament.

"There is a fascination in the unchangeable features of the Nile regions. There are the vast pyramids that have defied time ; the river upon which Moses was cradled in infancy ; the same sandy desert through which he led his people, and the watering-places where their flocks were led to drink. The wild and wandering Arabs, who, thousands of years ago, dug out the wells in the wilderness, are represented by their descendants unchanged, who now draw water from the deep wells of their forefathers, with the skins that have never altered their fashion.

"The Arabs gathering with their goats and sheep around the wells to-day, recall the recollection of that distant time when

'Jacob went on his journey, and came into the land of the people of the East. And he looked, and behold a well in the field, and, lo, there were three flocks of sheep lying by it,' etc. (Gen. xxix. 1, 2). The picture of that scene is an illustration of Arab daily life in the Nubian deserts, where the present is a mirror of the past."

The ancient Hebrews were wholly an agricultural and pastoral people. Hence the numerous references to this mode of life in the Bible. Abraham, Isaac, and Jacob, with his twelve sons and their descendants, were all shepherds, and for that reason—as "every shepherd is an abomination to the Egyptians"—when Israel and his sons, with their wives and little ones, had come to Egypt at the request of Joseph, in the waggons sent for them, they dwelt by themselves in the land of Goshen, where they had pasture for their flocks and everything else that was suitable and necessary for their occupation (Gen. xlv. 31-34, and Gen. xlvii. 1-6). Afterwards we find that "Moses kept the flock of Jethro his father-in-law, the priest of Midian" (Exod. iii. 1), and David rose from being a keeper of sheep to be king over Israel. The knowledge of ancient and modern pastoral life is therefore a key which unlocks the meaning of numerous passages which without it "are difficult and hard to be understood."

The life of a shepherd in Palestine, and in the East, is very different from that of a modern English shepherd, who has no anxiety as to wild animals or water, and has only a limited area as feeding ground. The pasture lands of the East are of vast extent, and common to all who choose to take their flocks to them. The only claim to the land in the old times of Scripture history seems to have lain in its cultivation, or in its prior appropriation around some particular well; for the shepherds in the warm climates of the East have always one idea before their minds—the possibility of obtaining water for their flocks. In countries where there are no rivers, the wells are therefore the great centres of pasturage, which are kept carefully closed by their owners, and are only opened at noontide for the use of those who are entitled to water their sheep at them.

At that hour vast flocks may be seen converging towards their respective wells, the shepherd in charge of them at the head of each flock, and the sheep following him. Hence the reader will see the appropriateness of the imagery of David the shepherd-poet, (Psalm xxiii. 1, 2,) "The Lord is my shepherd; I shall not want. He maketh me to lie down in green pastures; He leadeth me beside the still waters."

Besides the Old Testament, there are numerous references to pastoral life in the parables of our Lord and the Epistles; but mention is not made in any part of the Bible of that invaluable animal the sheep-dog, excepting in the book of Job (xxx. 1): "But now they that are younger than I have me in derision, whose fathers I would have disdained to have set with the dogs of my flock." The truth is, that the Eastern dogs do not, as our sheep-dogs, assist in driving the flocks, because the sheep of these warm climates are led, not driven. There, as everywhere, the dog is the faithful servant of man, and is used as a guardian of the flock. He watches outside the fold, barking out a defiance on the approach of a wolf or a jackal; but down even to modern times the old Jewish idea of his uncleanness—certainly no longer to be tolerated under the Christian dispensation—still continues, and the poor animal is treated with but scant kindness.

The Psalmist, who speaks of God as the "Shepherd of Israel," and the people as sheep, always represents the sheep as being led, (Psalm lxxvii. 20,) "Thou leddest Thy people like a flock, by the hands of Moses and Aaron." Our Lord Himself and His apostles make use of the same imagery. The following account of the Spanish merino sheep is appended as illustrating John x. 2-5, and 1 Peter v. 2-4.

The merino sheep of Spain have long been famous for the fineness of their wool, and their very remarkable migratory instinct. These sheep pass the warmer portion of the year, from April to October, in the pastures on the slopes of the Pyrenees, and the rest of the year, or its colder part, on the plains towards the south. In the month of October they start for their winter's home in the

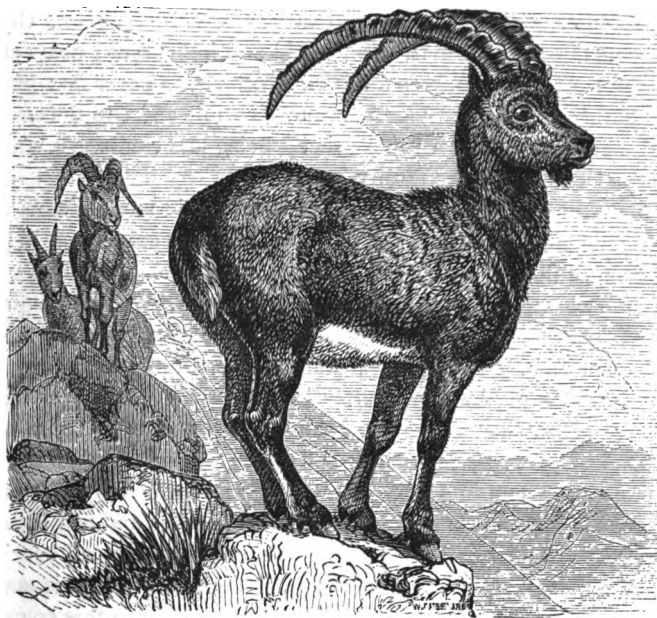
lowlands, travelling in detachments of 10,000 each, under fifty shepherds, and a mayoral or *chief shepherd* at their head (1 Peter v. 2-4). These sheep have a general right of pasturage over the entire kingdom. "Several of the sheep are tamed, and taught to obey the signals of the shepherds; these follow the leading shepherds (for there is no driving), and the rest quietly follow them (John x. 26-29). The flocks travel through the country at the rate of eighteen to twenty miles a day, but in open country, with good pasturage, more leisurely. The sheep know as well as the shepherds when the procession has arrived at the end of its journey. In April their migratory instinct renders them again uneasy, and if not guided they set forth unattended to the cooler hills, despite the vigilance of the shepherds. These stragglers, if not devoured by the wolves, are found in their old pasture, quietly awaiting the arrival of their companions." ("Cyclopædia of Useful Arts and Manufactures." By Charles Tomlinson. Vol. ii. p. 1030.)

The word "chamois" in Deut. xiv. 5, probably denotes the wild mountain-sheep, the Arabian Kebsch (*Ammotragus tragelaphus*). In Gen. xxxi. 10, 12, for "ram" we should read "he-goat." That in Scripture language the word "cattle" is sometimes used in reference to sheep, oxen, goats, has been already mentioned. (See page 72.)

Ammotragus tragelaphus (Gr. *ammos*, the sand, and *tragos*, a goat, and Gr. *tragos* and *elaphos*, a stag), an animal which would seem to be intermediate between the sheep and goats, inhabiting the mountains of the North of Africa, from Abyssinia to Barbary. It is of a reddish-brown colour, and on the front of the neck and the base of the forelegs, it has a large quantity of long hair hanging down, which gives it a singular appearance. It is exceedingly fierce, butting violently at its assailants with its long powerful horns. It lives in small flocks in the mountains, and does not appear to be particularly abundant.

THE COMMON GOAT (*Capra Hircus*, L.)

This animal bears a strong resemblance to the sheep, especially in warm climates, where the wool degenerates into hair, so that when sheep and goats are mixed together in hot countries, so entirely have the sheep lost their distinctive features that it is impossible for an unaccustomed eye to discern the difference, although



The Ibex.

it is easily enough distinguished by the shepherd. So, though in this world hypocrites mingle with God's people and resemble them, yet in the last day the "Great Shepherd" will detect them, and "He shall separate them one from another as a shepherd divideth the sheep from the goats; and He shall set the sheep on His right hand, but the goats on the left" (Matt. xxv. 32, 33). Does not this

fact in the natural history of both these animals as to their close approximation to each other in appearance in warm climates clearly and most impressively illustrate the meaning of the above passage? In cold climates, on the contrary, the difference in their physiognomy is much more striking. The distinction between the hair of the goat and the wool of the sheep is quite apparent, in addition to the other distinctive characteristics. The goat differs from the sheep in having a smaller head, with greater strength and activity of body. The temper and habits of the two animals are also different. Goats are confident and curious, sheep timid and indifferent; goats strip off the bark from the trees for food, which sheep never do; goats, in fighting, rear on their hind legs to give full effect to the stroke, and then butt with their heads; sheep, being less combative, simply do the latter, never the former.

Both animals, in a wild state, live in flocks in mountainous districts, the goats usually living amongst the rocky grounds at higher elevations, the sheep on the richer pasturage slopes towards the base. Two species of goat are found in Europe—one, the common ibex (*Capra ibex*), which inhabits the highest ranges of the Alps; the other, the Pyrenean ibex (*Capra Pyrenaicus*), found on the Spanish side of the Pyrenees. There are also several valuable species which live on the mountains of Asia, as the Angora goat (*Capra Angorensis*, Hasselq.), inhabiting the mountains in the vicinity of Angora in Asia Minor, the colour of which is milk-white, the legs being short and black, and both the horns and hair spirally twisted. The latter is disposed in beautiful ringlets all over the body, and is highly valued, not only in Turkey, where it is manufactured into the most costly Turkish robes, but in this country, into which it is imported under the name of Mohair, chiefly from Smyrna and Constantinople. Mohair is made up by suitable machinery into fine shawls, camlets, velveteens, braidings, decorative laces, and other ornamental trimmings for clothing.

The Thibet or Cashmir goat (*Capra laniger*), which occupies the declivities of the Himalaya Mountains and the upland plains. The body of this goat is covered with long hair of a silky texture,

beneath which is an undercoat of fine soft wool, from the delicate down of which the costly and beautiful Cashmere shawls are made, which are sold in London at from £100 to £400 each. To the people of Cashmere this manufacture is very important, the annual sale there amounting to 30,000 shawls. Lastly, there is the Jaal goat, belonging to the Sinaitic mountains and those of Upper Egypt and Abyssinia; and the Rocky Mountain goat of North America, attached to their loftiest and least accessible summits. It is indeed truly astonishing to what a height these animals can climb, entering into an atmosphere so rarefied that it is hardly possible for the hunter who follows them to breathe it and live. Sheep have been observed on Ben Nevis at a height of 3,000 feet above the level of the sea; but the range of the chamois goat on the Alps is between 6,000 and 9,000 feet elevation; whilst the Cashmere goat on the Himalayas is found at a height of even 13,000 feet, in a home all but inaccessible to man, on account of the excessive cold and the rarity of the atmosphere.

To the goat, as to every animal, has been allotted some means for self-preservation. The senses of these animals are exceedingly acute, and serve, not only to direct them in the choice of their food, but also to warn them on the approach of danger. Their eyes are placed, not in the front of the head, but at the side of it, so that they can see as far backward as they can forward; and they have moveable ears, which can therefore be turned in any direction, so as to grasp and gather in the undulations of sound. Their sense of smell especially is acute, so that the hunter always finds it necessary to approach them from the opposite quarter to that in which the wind is blowing. When alarmed, they seek safety in flight, and the structure of their bodies is such as to ensure their swiftness. With their horns in front they gore their enemies, and with their heels behind they are able to inflict on them a number of powerful blows in rapid succession. The agility and sure-footedness with which they bound from rock to rock in their mountain home is indeed truly wonderful, when quietly feeding on the flowers and young shoots of plants, but especially

when their fears are alarmed. They will then take the most direct line of flight to some secure and apparently almost inaccessible position at which they aim, scaling rocks almost perpendicular, leaping across the most frightful chasms, and alighting on ledges of rock so narrow as to be almost imperceptible, with a rapidity and boldness which is both "great and marvellous." When hard pressed by the hunter, the goat will even throw itself down the most dreadful precipices of the mountains, invariably falling upon its horns, the elasticity of which secures it from injury.

The flesh of the goat is not equal to that of the sheep, and they are chiefly valued for their milk and the skins of their young ones, which are used chiefly in the manufacture of kid gloves. That the hair of the goat was used as an article of manufacture in very early times, long before Cashmere or Camlet shawls were worn, is clear enough from many passages in the Bible. Thus the curtains which covered the roof of the Jewish tabernacle were made of goats' hair, spun by the women (Exod. xxvi. 7, and xxxv. 26); and a pillow of goats' hair is mentioned as supporting the head of the image with which Michal deceived the messengers of Saul (1 Sam. xix. 13-16). The mountain home of the goats is referred to in Psalm civ. 18, "The high hills are a refuge for the wild goats;" their dwelling among the rocks, in 1 Samuel xxiv. 2, "And Saul took 3000 chosen men out of all Israel, and went to seek David and his men upon the rocks of the wild goats;" and also in Job xxxix. 1, "Knowest thou the time when the wild goats of the rock bring forth?" and the nutritious character of their milk is mentioned in Proverbs xxvii. 23-27, "Be thou diligent to know the state of thy flocks, and look well to thy herds. For riches are not for ever: and doth the crown endure to every generation? The hay appeareth, and the tender grass showeth itself, and herbs of the mountains are gathered. The lambs are for thy clothing, and the goats are the price of the field. And thou shalt have goats' milk enough for thy food, for the food of thy household, and for the maintenance for thy maidens." We have given the whole passage, which refers directly to pastoral life

as it existed, according to the chronology of the margin, about seven hundred years before Christ, and therefore more than two thousand five hundred years ago. As a record of the state of the ancient arts of agriculture and manufactures in the primæval ages of the world, which necessarily include the animals and plants most useful to man known at that time, the Scriptures are most



The Ibex (*Capra Sinaitica*).

interesting. Since then natural history has advanced, and many animals and plants have been added to the catalogue of those already known. In one word, natural history has given us greatly enlarged views of that storehouse of food, warmth, and clothing, which the earth contains. In this respect the wealth of nature is inexhaustible. (Ps. civ. 24,) "The earth is full of Thy riches."

Wild goat represents two different words in the original. The

first of these occurs once only (Deut. xiv. 5); it has been identified with the *paseng*, the *roebuck*, the *ibex*. The last opinion is perhaps most probable.

The other occurs in 1 Samuel xxiv. 2; Job xxxix. 1; Psalm civ. 18, where it is rendered *wild goat*; and Proverbs v. 19, where it is wrongly translated *roe*. This also is probably the *ibex* (*Capra Sinaitica*).

One of the Hebrew words signifying "he-goat" (literally meaning "hairy") is translated *devils* in Leviticus xvii. 7; 2 Chronicles xi. 15: the reference is, probably, to some heathen deity worshipped under the form of a goat.

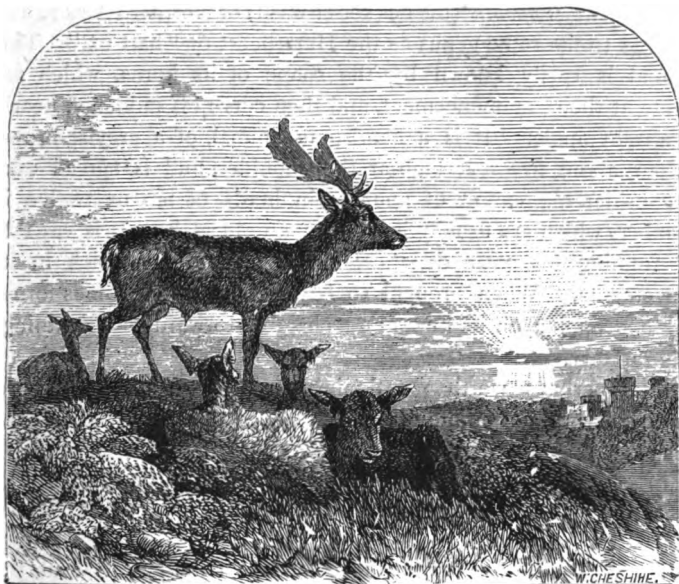
The same word is rendered *satyrs* in Isaiah xiii. 21, xxxiv. 13. There is great difference of opinion as to the meaning; but our translators seem to have understood the word in a sense similar to that just explained. Others suppose that the *baboon* is meant.

THE DEER (*Cervus dama*).

The animals of this group, celebrated for their beauty, vigour, and speed, are found in all parts of the world, excepting Australia and the southern and central parts of Africa. The males are possessed of horns or antlers, which they use both for attack and defence; the females, with the single exception of the reindeer, are totally without them. They are gregarious, delight in a wooded country moderately elevated, and trust principally to their swiftness of limb for safety. They have a muscular neck, a slender body, large and full eyes, and a small high head, which they carry high.

There were at least two species of deer inhabiting Palestine in the earlier periods of Jewish history, the fallow deer and the red deer; the latter (*Cervus elaphus*) still exists in great numbers amid the solitudes of the Scottish mountains, and is occasionally seen in gentlemen's parks. Both species are probably included under the hind or hart of Scripture. The first time this animal is mentioned is by the patriarch Jacob, when blessing his son Naphtali. (Gen. xlix. 21,) "Naphtali is a hind let loose: he giveth goodly

words." Next we find it turn up, as might be expected, among the animals which were allowed as food, (Deut. xii. 15,) "The unclean and the clean may eat thereof, as of the roebuck, and as of the hart." Allusion is made to its speed and agility, (Isaiah xxxv. 6,) "Then shall the lame man leap as a hart;" and (2 Samuel xxii. 34,) "He maketh my feet like hinds' feet;" and nearly four hundred years afterwards the same words are used by Habakkuk, (iii. 19,) "The



Red Deer.

Lord is my strength, and He will make my feet like hinds' feet, and He will make me to walk upon mine high places." Also Solomon alludes to the same thing, (Song ii. 8, 9,) "The voice of my beloved! behold, he cometh, leaping upon the mountains, skipping upon the hills. My beloved is like a roe or a young hart." And David compares the thirst of his soul after God to

a "hart" panting "after, the water-brook" (Psalm xlii. 1, 2). The words hart and hind occur also in Deut. xii. 22, xiv. 5, xv. 22; 1 Kings iv. 23; Song Sol. ii. 7, 17, iii. 5, viii. 14; Lam. i. 6; Job xxxix. 1; Psalms xviii. 33, xxix. 9; Prov. v. 19; Jer. xiv. 5. The title of Psalm xxii., Aijelet Shaha, is "the hind of the morning."

The word fallow deer occurs in Deut. xiv. 5, and 1 Kings iv. 23. There is good reason for believing that the animal referred to is the *Alcephalus bubalis* (the bekker-el-wash) of Northern Africa, and belongs to the same genus as the Hartebeest or "hart-ox." This animal is easily known by the shape of its horns, which are lyrate at their commencement, and then curve off suddenly, nearly at a right angle. It is a handsome animal, of a greyish-brown colour, about five feet high at the shoulder, and is spread over a considerable extent of country, in herds of ten or twelve in number, which are usually headed by an old male. It is capable of running for some distance, although not very quick in its movements. When brought to bay, however, it becomes formidable, dropping on its knees and charging forward with lightning-like rapidity.

It is perhaps worth mentioning that in Scripture the word "venison" is not limited to the flesh of deer, but denotes the flesh of any animal taken in hunting.

THE GAZELLE, OR ROE (*Gazella dorcas*).

There are several varieties of antelope in Palestine at the present time, which formerly must have been more abundant; all of them are referable to the single species (*Gazella dorcas*), and there is little doubt that all are referred to in the Scriptures. This species, the gazelle, so celebrated in eastern poetry for its grace and beauty, is undoubtedly the roe so often alluded to in the Bible. It is the commonest species of antelope in the north of Africa and the western parts of Asia, and therefore its range necessarily embraces Palestine, the principal site of the Scripture

narrative. It is a graceful little species, with small, black, and lyrate horns, tawny above, and white beneath. The Arabs hunt them on horseback, and break their legs by throwing a heavy stick at them. When taken alive, they are easily tamed, and then they become great favourites all through the East for their gentleness and docility. This beautiful species is seen in Arabia and Syria in large herds, bounding over the desert with a fleetness which distances the swift greyhound. Although so wild and timid, it is soon domesticated, and is much prized for its beauty, exquisite



The Gazelle.

form, and playfulness. Tame gazelles are quite common in the courtyards of houses in Syria.

The word rendered roe or roebuck occurs sixteen times; viz., in Deut. xii. 15, 22, xiv. 5, xv. 22; 2 Sam. ii. 18; 1 Kings iv. 23; 1 Chron. xii. 8; Prov. vi. 5; Song Sol. ii. 7, 9, 17, iii. 5, iv. 5, vii. 3, viii. 14; Isa. xiii. 14; not reckoning 2 Sam. i. 19, which some render, "The gazelle, O Israel, is slain," etc. In Prov. v. 19, the word rendered roe should be *wild goat*.

In the Bible the swiftness of the roe, or gazelle, is alluded to. We are told that "Asahel," one of the "three sons of Zeruiah,"

THE ZOOLOGY OF THE BIBLE.

Sam. ii. 18,) "was as light of foot as a wild roe;" and in the enumeration of the fighting men which David mustered in his struggle against Saul, twelve Gadites are mentioned, who, besides their other qualifications, are said to have been (1 Chron. xii. 8) "as swift as the roes upon the mountains." The fact that the roe was hunted is mentioned, Prov. vi. 5: "Deliver thyself as a roe from the hand of the hunter, and as a bird from the hand of the fowler." The beauty of the roe is frequently alluded to in Solomon's Song, and the Song itself closes with an invocation to the beloved, who is compared to the same beautiful animal.

ORDER VI.—RODENTIA, OR GNAWING ANIMALS.

The rodentia, or gnawing mammalia, are distributed all over the world, even Australia possessing some few indigenous species. These animals are for the most part of small size, and are distinguished by the possession of two pairs of curved cutting or incisor teeth in the front of each jaw, and the presence of from two to six molars on either side of it, the canine teeth being absent from the jaw. The former, therefore, require a sharp cutting edge or bite of enamel, harder than the ivory teeth which it covers superficially, which wears much more slowly than the ivory into a bevelled or sloping edge, always projecting, sharp, and efficient, and capable of cutting through the hard vegetable substances



Skull of Rodent animal.

through which the animal gnaws. This leaves a space without teeth in the upper and lower jaw, between the curved cutting teeth and the molars, the latter being composed of alternate plates of enamel and ivory, which, wearing unequally, the former stand up in ridges, giving them a rasp-like surface, the ridges being transverse, or in a direction from side to side of the head. The lower jaw has also considerable lateral motion, which gives it a grinding or triturating action on the upper.

The curved front teeth are never shed during the life of the animal, the new matter being added at their upper points, and never growing at their base, excepting "When," to quote the words of Professor Owen, "by accident an opposing incisor is lost, or when, by the distorted union of a broken jaw, the lower incisors no longer meet the upper ones, as sometimes happens to a wounded hare, the incisors continue to grow until they project like the tusks of the elephant; and the extremities, in the poor animal's abortive attempts to acquire food, also become pointed tusks, and following the curve prescribed to their growth by the form of the socket, render masticating impossible, and cause death by starvation."* The Bible animals included under this division are

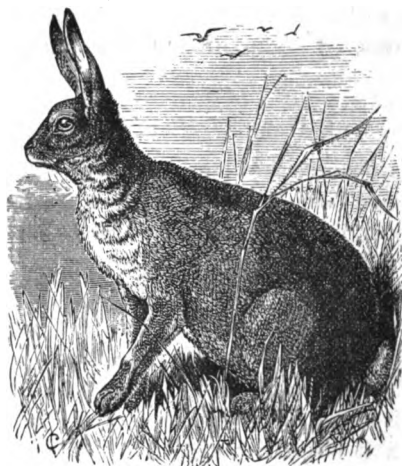
THE HARE (*Lepus timidus*).

The hare is distinguished from the other Rodentia by the presence of a small incisor behind each of the two large cutting teeth of the upper jaw. The molar or grinding teeth are usually six in the upper and five in the lower jaw, with a ridge of enamel on their surface. The species are distributed over the whole earth, Australia excepted, but they are the most plentiful in temperate climates. The hare is exclusively a vegetable feeder. It frequents thickets during the day, where it rests in a slight hollow which it makes on the surface of the ground, called its form, to which it is much attached, its brown fur aiding to conceal it amongst the russet herbage by which it is usually surrounded. At night it comes forth to feed on the green bark of young trees and the various kinds of herbage. Its natural timidity and defencelessness have been beautifully compensated by its extreme watchfulness, the acuteness of its senses, and its swiftness of foot. Its eyes are so situated that it can see behind as readily as before, and its large ears have been endowed with such great power of mobility, that in an instant they can be laid flat, and the next moment raised and directed towards

* See Owen's Odontology, pp. 104, 411.

any point of the compass from whence the faintest sound issues. It swims well, taking fearlessly to the water to avoid pursuit or to obtain food.

The structure of the rabbit (*Lepus cuniculus*) closely resembles that of the hare, the smaller size of the former being the chief difference. The two animals, however, differ in their habits. The hare is a solitary animal, the rabbit lives in societies; the hare squats upon the ground only, the rabbit burrows beneath its surface; the rabbit is not found in Palestine, the hare is particularly abundant there.



The Hare.

By the law of Moses, the hare was forbidden to the Jews as food. All animals were prohibited then as food, excepting those ruminants which chewed the cud and divided the hoof. Thus, the ox, goat, sheep, and antelope, fulfilling both of these conditions, were allowed; whilst the hare, camel, coney, and pig were forbidden because they did not fulfil them. (See Lev. xi. 3—7, and Deut. xiv. 7.) Here we find that, by the Levitical law, the camel, hare, and coney were not allowed as food, because, although they chewed

the cud, they divided not the hoof, and also that the pig was forbidden to be eaten, because, although he fulfilled the latter, he did not the former of these conditions of the code. But every zoologist knows that none of the above animals mentioned as chewing the cud, do so, excepting the camel, which is a ruminant. The hare is a rodent, or gnawing animal, and it is utterly impossible from the structure of its teeth and stomach that it should do such a thing.

Now to a non-scientific observer, the hare really does seem as if she were chewing the cud. The curved incisor teeth of the upper and lower jaw of this animal, in common with those of every other rodent, are never shed, but continue to grow throughout its whole life. Hence it is that, whenever at rest, the hare is continually sharpening the chiselled edges of its incisor teeth, the loss of matter by this process being constantly replaced by continual deposition of new dental material at their bases. A peculiar movement resembling that of rumination is thus given to the mouth; and Cowper the poet, who kept hares for several years, was deceived by their mumbling into believing them to be ruminants, and thus writes about his favourite hare "puss":—"Finding him exceedingly tractable, I made it my custom to carry him always after breakfast into the garden, where he hid himself generally under the leaves of the cucumber vine, sleeping or chewing the cud till evening."

The truth is, that the Bible was never intended to be a textbook either to natural or physical science, or to chemistry. The Mosaic law, and the other parts of Scripture subsequently revealed, were evidently given in accordance with the knowledge on scientific subjects which prevailed at the time, and both are simply intended to be (2 Peter i. 19) "a more sure word of prophecy, whereunto ye do well that ye take heed as unto a light that shineth in a dark place, until the day dawn, and the day star arise in your hearts;" and the object of that "word of prophecy" is to bring "life and immortality to light through the gospel" (2 Tim. i. 10); "to give light to them that sit in darkness and in the shadow of

death, to guide our feet into the way of peace" (Luke i. 79). Such researches into God's works it is the duty of man to make, in accordance with the command given from the commencement, (Gen. i. 28,) "Subdue the earth, and have dominion;" and that God who gave the command has given him the ability for this purpose. It is our duty to interpret God's word on such subjects by His works, which are only another revelation of "His eternal power and God-head," and thus obtain correct views of Scripture, and grander, more enlarged ideas as to its meaning. And *correct views of God's works*, obtained by the study of them, cannot but be acceptable to Him, and give us *correct views of His Word*.

THE MOLE RAT (*Spalax typhlus*).*

There are two Hebrew words which are translated as mole in our authorized version of the Bible, *tinshemeth* and *chephor-peroth*. The first occurs in Lev. xi. 30, "And the ferret, and the chameleon, and the lizard, and the snail, and the mole." About the meaning of this Hebrew word there is great uncertainty; some Hebrew scholars thinking that in this verse the word should have been rendered chameleon, and that the word translated chameleon in the same verse (Lev. xi. 30) denotes some other animal. The other word, *chephor-peroth*, which is translated mole, is met with in Isa. ii. 20, "In that day a man shall cast his idols of silver, and his idols of gold, which they made each one for himself to worship, to the moles and to the bats."

Now the animal unquestionably alluded to is the mole of Palestine, which certainly is not the same species as the European mole; on the contrary, it is much larger, and belongs to a totally different natural order. The English mole is insectivorous, allied to the hedgehog and the porcupine, the Palestine mole is a rodent, related to the mouse and rat; its proper name is the mole-rat (*Spalax typhlus*), or literally, blind mole (Gr. *spalax*, a mole, and *typhlos*, blind), by which name it is known to zoologists.

* See "Bible Animals," by the Rev. J. G. Wood, 1869.

In their general appearance these animals look like moles, the form of their body and the structure of their limbs indicating their subterranean life. The body is stout, elongated, and cylindrical, the legs short, the anterior being stronger than the posterior, and the feet all furnished with five toes. Like the English mole, the eyes are so minute as to be invisible through the soft slate-coloured fur covering the body, and the external ears are not to be seen, although the internal ones are large and extremely sensitive to sound. This circumstance renders the head of the mole-rat apparently featureless. The tail, like the ears, is either rudimentary or



The Mole Rat.

wanting. The incisor teeth are broad, project from the mouth, and are not only formidable in appearance, but in reality, as the mole-rat bites severely.

These animals are very common in Palestine, their mines and mounds being everywhere visible. Like the English mole, they rest during the day, and are active only at night ; nevertheless it is not necessary for them to dig such tunnels as the English mole, which feeds on worms and insects, because they live mostly on roots, preferring such as are of a bulbous nature. The root-crops of Palestine are often seriously damaged by them.

The mole-rat is fond of frequenting deserted ruins and burial places, so that mole-rats and bats are really companions, and as such are associated together in the sacred narrative. It is thus that we find, when the lights of natural history and Hebrew criticism are

brought to bear upon the Bible, both only tend to confirm its truth and make its meaning far better understood.

THE FIELD-MOUSE (*Arvicola agrestis*).

The mouse is mentioned among the animals forbidden as food (Lev. xi. 29). It also figures in connexion with the loss and recovery of the ark of the covenant. It appears from that portion of Jewish history recorded in 1 Sam. iv.—vi., that the Israelites, having been defeated by the Philistines, to ensure for the future victory for themselves, made an unwarrantable use of the ark by having it brought into their camp, and that they were again beaten in



The Field Mouse.

battle, and the ark itself, captured by the Philistines, was carried off by them into their own country. Then various signs were given to the captors that they should send the ark back to the Israelites, which being insufficient, they were next assailed by a painful and fatal disease which killed great numbers of them, whilst their harvests were destroyed by immense numbers of "mice that marred the land" (1 Sam. vi. 4, 5, and 11—18.

Now that the Hebrew word *akbar*, here translated mice, means some rodent animal, is evident, but it is impossible to say to what species the word refers. It may, however, be safely concluded

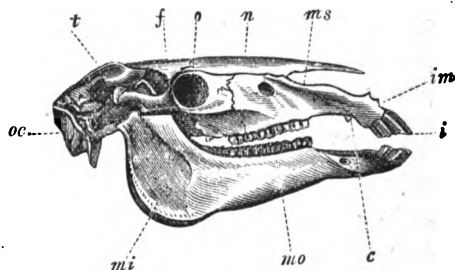
that it must have been some animal which devoured the produce of the field, and existed in sufficient numbers to make its voracity formidable. It is a remarkable fact that those unwelcome rodentia, rats and mice, are more extensively diffused over the globe than perhaps any other animal. The European species follow man, and take up their abode with him in whatever country or climate he builds himself a homestead. Besides, nearly every country has its own species of these animals, including Palestine, and the common field mouse (*Arvicola agrestis*) is especially abundant there; and as it is remarkable for its extraordinary voracity and the rapidity of its multiplication, it would be quite sufficient to inflict upon the Philistines all the evils of which they complained. The word occurs Isaiah lvi. 17, "eating swine's flesh, and the abomination, and the mouse," and is most probably not to be restricted to one species. The jerboa is probably included, little rodent animals, having the hind legs greatly developed, so that they hop along like kangaroos, and take surprising leaps. The fore legs are very short, and the feet are furnished with four toes armed with claws, with which they dig the burrows in which they live.

We have two species of field mice in this country, the wood mouse (*Mus sylvaticus*), and the harvest mouse, *Mus messorius*, (Lat. *messor*, a reaper), both very destructive in fields and gardens, as they not only devour large quantities of produce, but lay up considerable stores in their burrows for winter. The harvest mouse is the smallest of the British mammalia known. It is an exceedingly elegant minute species, which forms a beautiful round nest, supported amongst the stalks of the corn plants. There are in the nest usually eight young ones, almost entirely filling its little cavity, and the parent closes the entrance so carefully that the real opening is with difficulty discovered. The nest itself is made of the leaves of corn most ingeniously plaited together.

ORDER VII.—PACHYDERMATA, OR THICK-SKINNED ANIMALS.

THE HORSE (*Equus caballus*, L.)

The horse belongs to the natural order Pachydermata (Greek, *pachus* thick, and *derma* a skin), or thick-skinned animals, which comprises some of the largest and strongest of all living quadrupeds, as the elephant, rhinoceros, hippopotamus or river-horse, and wild boar. To all these animals the horse is closely allied, as also to the tapir, which is common to both the Old and New Worlds. The tapir has a prolonged, flexible snout, and is not at all unlike a large pig in its general appearance and its habit of "wallowing in the mire."



Skull of Horse.

oc, Occipital bone; t, temporal bone; f, frontal bone; o, orbital socket for the eyes; n, nasal bones; ms, maxilla superioris, upper jaw; mi, maxilla inferioris, lower jaw; i, incisor teeth; im, intermaxillary bone; mo, molars; c, rudimentary canine tooth.

The most remarkable feature about the horse is the structure of its feet, which consist of a single toe only, the representative of the middle toe, inclosed at its extremity in an entire hoof. Hence naturalists have placed the horse under the division *Solidungula* (Lat., *solida* entire, *ungula* a hoof), to which also the ass and the zebra belong. The horse is herbivorous, and its dentition corresponds with its habits. There are in the mouth of the horse six incisor or cutting teeth in the front part of the upper and lower jaw, and six molars on either side of it, above and below; the former are not inserted into the *alveola* or sockets of the jaw verti-

cally, but obliquely,—so that their points unite like a pair of pincers,—enabling the animal to nip or bite off the grass. The molars, *mo.*, or grinding teeth (Lat., *mola*, a mill), the crowns of which are furrowed with ridges of enamel, a substance much harder than bone, always preserve for this reason their grinding efficiency in reducing to a pulp the grass and other vegetables. These molars, or grinding teeth, are situated at the back of the mouth, and separated from the incisors in front by a considerable interval of jaw devoid of teeth. This is the part of the jaw in which the bit is placed, by which alone man has been enabled to subdue these valuable animals. The use of the bit was known even in apostolic times, (James iii. 3,) “Behold, we put bits in the horses’ mouths, that they may obey us, and we turn about their whole body.”

The varieties of the horse are not so numerous as those of the dog, neither do they differ so widely from each other. There is the same general figure, flowing mane and tail in all the varieties, which is characteristic of the species. One variety is remarkable for its heavy build, robust strength, and slow pace, and is employed as a draught horse; another variety, more slenderly built, and equally distinguished for its swiftness and powers of endurance, is employed as a hunter, race-horse, and carriage-horse. Wales and Shetland have long been famous for miniature horses of great beauty, spirit, and strength, called ponies. The horses of Arabia are the most celebrated, and it is from these that our finest breeds of English horses derive all their good qualities.

The Arabian horse has been carefully bred for several thousand years, so that it is not surprising that it has so many excellent qualities. The Egyptian horse is of coarse make, often vicious, and requires to be tied; the Arabian is much finer in his build, with an expansive forehead, beautiful eye, and gentle disposition, although full of fire and impetuosity when aroused, and fleet as the storm wind in the race. He is never tied, but may be seen wandering about the camp, gentle and inoffensive as a camel. The Arab receives the newly born animal in his arms, washes and stretches its tender

limbs, and caresses it as if it were a baby. After this he places it on the ground, and watches its feeble steps with particular attention, and from that time forms his opinion as to the excellences or defects of his future companion.

Bishop Heber thus speaks of an Arabian horse he rode in India: "My morning rides are very pleasant. My horse is a nice, quiet, good-tempered little Arab, who is so fearless, that he goes without starting close to an elephant; and so gentle and docile, that he eats bread out of my hand, and has almost as much attachment and as many coaxing ways as a dog. This seems the general character of the Arab horses, to judge from what I have seen in this country. It is not the fiery, dashing animal which I had supposed, but with more rationality about him, and more apparent confidence in his rider, than the majority of English horses."

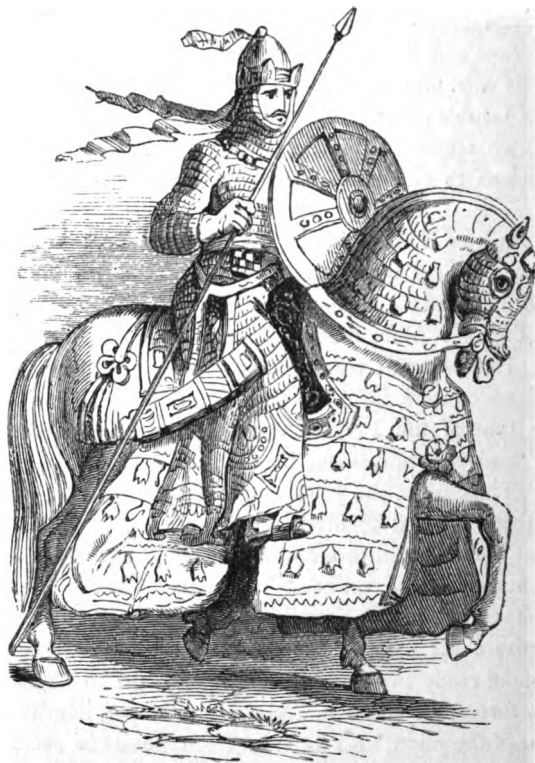
The horse was undoubtedly domesticated in very early times, and was used especially in war and on state occasions. The Egyptians possessed numerous war-horses, as appears from their monuments, and also from the books both of Genesis and Exodus; and to prevent the evil results to the Israelites of holding intercourse with them, all traffic with Egypt in horses was forbidden by the law of Moses; (Deut. xvii. 16,) "But he shall not multiply horses to himself, nor cause the people to return to Egypt, to the end that he should multiply horses: forasmuch as the Lord hath said unto you, Ye shall henceforth return no more that way." This law, given by Moses in reference to the conduct of the future Israelitish kings, was most flagrantly and openly violated by Solomon, who is represented as having "forty thousand stalls of horses for his chariots and twelve thousand horsemen" (1 Kings iv. 26), and also as having "had horses brought out of Egypt" (1 Kings x. 28); for the Scriptures faithfully record, not only the good, but the bad deeds of their most illustrious characters, the latter always being mentioned in terms of condemnation. The fine description of the horse in the book of Job, xxxix. 19-25, shows that his strength, courage, and use in war were understood and appreciated in patriarchal times.

During the years of famine in Egypt, horses were taken from the Egyptian people by Joseph, in exchange for the corn which he sold them ; and after the death of Jacob, when Joseph had obtained the permission of Pharaoh to bury the honoured and loved remains of his father in the family grave, "there went up with him" to that hallowed spot, "the cave that is in the field of Machpelah," "both chariots and horsemen, and it was a very great company." See Genesis xlix. 29-33, and l. 1-9, where we have an affecting account of Jacob's death and burial ; also, of the affectionate and exemplary character of Joseph, who "commanded his servants the physicians to embalm his father," and then fulfilled his last wishes.

If we turn from biblical history to the ancient classics, we find that the ancient Scythians were celebrated horsemen, and that the ancient Britons attacked the army of Julius Cæsar, when he invaded England from the French coast, with horsemen and chariots. Horses apart from chariots were not much employed in martial encounters, until cavalry began to be used in battle about the time of the Persian wars. Every Roman legion contained a body of horsemen, in addition to its complement of infantry. Thus, when the Jews sought Paul's life, and more than forty of them "bound themselves with an oath that they would neither eat nor drink till they had killed him," the "chief captain," who had him in charge, on being informed by Paul's messenger of the conspiracy, decided to send him to Felix, the Roman governor ; and, to ensure his safety, "he called unto him two centurions, saying, Make ready two hundred soldiers to go to Cæsarea, and horsemen threescore and ten, and spear-men two hundred, at the third hour of the night, and provide them beasts to set Paul on, and bring him safe to Felix the governor." "Then the soldiers, as it was commanded them, took Paul, and brought him by night to Antipatris. On the morrow they left the horsemen to go with him, and returned to the castle" (Acts xxiii. 21, 23, 24, and 31, 32). Here it is clearly shown that Paul was accompanied by both Roman cavalry and infantry to Antipatris, where he was com-

paratively speaking safe, and that the infantry then left him, an escort of Roman cavalry being considered quite a sufficient protection for him for the remainder of the journey.

The ancient saddle seems to have been only a piece of cloth,



Eastern War-horse.

leather, or hide, which was placed on the back of the horse to render the seat of the rider more comfortable. The Persians were the first to use this, and to them, according to Xenophon, the invention of the saddle is to be ascribed. Saddles, such as are

used at the present day, were certainly unknown to both Greeks and Romans. In the middle ages, fighting was almost entirely a conflict of horsemen. The tournaments were of this character, and, for the most part, public trials of skill between horsemen armed with lances, who charged each other at a gallop from opposite points of an arena, the object of each being to remove his antagonist from the saddle. These horses were strong and courageous, and furnished with silver bridles, gilt trappings, rich saddles, their necks and breasts being armed with plates of iron. Their docility and obedience was such, that, at a word from their rider, they would with their teeth reach him up from the ground his lance or any other weapon, or dash off at a gallop upon his antagonist, striking out at him with their heels.

Most of my young readers may have heard of the famous war-horse Bucephalus, which Alexander broke in the presence of his father Philip and the assembled court, and which afterwards carried him in his battles with the Persians ; but some of them may not have heard of Copenhagen, the brave and noble horse of the Duke of Wellington, his faithful friend and servant during the Peninsular war, but more especially at Waterloo. Speaking of Waterloo to Mr. Rogers : " On that day," said the Duke, " I rode Copenhagen from four in the morning till twelve at night, and when I dismounted he threw up his heels at me as he went off. If he fed, it was on the standing corn, and as I sat in the saddle. I rode him hundreds of miles in Spain, and at the battle of Toulouse." The Duke did not forget his services, but made him as comfortable as possible in his old age. He had everything that horse could wish to make him happy, a good stable, and a rich pasture ground, and was fed twice a day, sometimes taking his meals from the hand of the Duchess herself, who used to feed him with bread. In the latter part of his life his oats were broken for him. He was, as he deserved to be, a great pet with the family ; and the Duke, when at Strathfieldsaye, where he was kept, very seldom omitted to pay him a daily visit. Thus he was rewarded for his toil at Waterloo and on other battle-fields ; and after surviving his master, and

following him to his last resting-place, he finally succumbed himself, and was buried with military honours. A small circular railing surrounds his grave. Of Copenhagen as a war-horse, at Waterloo and elsewhere, it may be truly said, "He mocketh at fear, and is not affrighted ; neither turneth he back from the sword. He saith among the trumpets, Ha, ha ; and he smelleth the battle afar off, the thunder of the captains, and the shouting" (Job xxxix. 22, 25). He did his duty, otherwise the "Iron Duke" would not have so honoured him.

The horse has been almost from time immemorial in subjection to man. His native country was probably Central Asia, and the Egyptians may have been, as some suppose, the first to tame him ; but it certainly is a hopeless task in the present day to attempt the discovery of the particular district first inhabited by this valuable animal. There is every reason to believe that most if not all the wild horses, even those which range over the vast steppes of Central Asia, are the descendants of individuals which have escaped from captivity and a domestic life. The wild horses on the Pampas or plains of South America are well known to have been introduced by the Spaniards, A.D. 1537. In a wild state, horses generally live together in herds, which are usually led by an old male. They are exceedingly rapid in their movements, and, when attacked, defend themselves by kicking violently with their heels. The Guachos, or natives of the Pampas, catch them by means of a lasso, or rope of leather, which they use with great skill. They are almost wholly dependent upon these wild horses for a livelihood. They sell their hides and hair to traders, who collect it for the markets of Buenos Ayres and Monte Video. It is said that a Guacho can break in a wild horse in about an hour, and having done so he is rarely off his back, except during the hours of sleep. The Tartars of Central Asia not only employ the horse for riding and as a beast of draught and burden, but they prepare butter and cheese from the milk of the female, and also an intoxicating drink called "koumiss."

Five Hebrew words denote the horse. 1. The commonest

occurs more than 130 times, and usually signifies chariot-horse.

2. The second denotes a cavalry or riding-horse; also a rider on horseback; and sometimes our translators have given it this second meaning where it ought to have the first, viz., 1 Kings iv. 26; Isa. xxi. 7, 9, xxviii. 28; Ezek. xxvi. 10, xxvii. 14; Joel ii. 4; and perhaps Habak. i. 8, "and their horsemen shall spread themselves." 3. The third Hebrew word occurs only once (Esther viii. 10) where "young dromedaries" should be *sons of mares*.

4. The word rendered *dromedary* in 1 Kings iv. 28, *mule* in Esther viii. 10, 14, *swift beast* in Micah i. 8, really means a superior horse.

5. An adjective, meaning "strong," is used (as is mentioned above under "Ox") to denote both bull and horse. Thus in Jer. viii. 16, by "strong ones" we must understand "strong horses," as in Jer. xlvii. 3. The same meaning belongs to the word in Jer. l. 11, and perhaps in Judges v. 22, "Then were the horsehoofs broken by the means of the pransings, the pransings of their mighty ones."

The horse mentioned in the Scriptures is mostly used for military purposes, although from some passages (Isa. xxviii. 28) it would appear to have been sometimes employed in the rude agriculture of that early period. Hosea xiv. 3, "We will not ride upon horses," is best explained by Isaiah xxxi. 1, "Woe to them that go down to Egypt for help; and stay on horses, and trust in chariots, because they are many."

THE ASS (*Equus Asinus*).

This well-known animal belongs to the same natural order and family as the horse, and, in common with that invaluable quadruped, is of Asiatic origin. It has a very wide geographical range on the Asiatic continent, extending from Siberia to the southern extremity of the peninsula of Arabia. It is still found wild in Central Asia, Persia, and Arabia, where, according to naturalists, there are several species; but there is much uncertainty respecting them, and it is not known from which species the domestic variety has been derived.

The ass appears to have been brought into a state of servitude at a still earlier period than the horse, and in ancient times, in Eastern countries, was, together with the camel and dromedary, in common use for riding and carrying burdens, the horse being employed almost exclusively for war. This fact being borne in mind, the numerous passages in the Scriptures, in which reference is made to both animals, become at once clearly understood. The saddling of the ass for a journey is mentioned Gen. xxii. 3, and 1 Kings xiii. 13, and the use of the horse in battle in Prov. xxi. 31, and Jer. viii. 6. These texts are only given as samples of many more which might be quoted, and the services of both animals similarly contrasted.

The earliest mention of the ass in the Scriptures is in the enumeration of the possessions of Abraham whilst he was in Egypt, where herds of he-asses and she-asses, oxen, sheep, and camels, are mentioned (Gen. xii. 16). From the distinct mention of she-asses, it is probable that the patriarchs used their milk. "She-asses" are mentioned as among the flocks of the patriarch Job. (See Job i. 3, and xlii. 12.)

In the East, even now, these animals are much valued, being treated with the greatest care and kindness, and far more frequently employed than horses, both for riding and carrying burdens. The finest breeds are found in Arabia, Persia, and Syria. The ass in these countries is very different, both in appearance and spirit, from our own undervalued and much-despised animal. In this country the ass is most shamefully treated, beaten, overworked, and indifferently fed, so that he has naturally degenerated into the somewhat shabby-looking and apparently stupid creature with which all are familiar.

The ass has ever been a respectable and well-used animal in Oriental countries, and is spoken of throughout the Scriptures as much valued by all classes of people. Persons of high rank rode in public on these animals. Thus Jair, for twenty-two years one of the judges of Israel, had "thirty sons that rode on thirty asscolts, and they had thirty cities" (Judges x. 3, 4). See also

Judges xii. 13, 15. White asses were chosen and appropriated by those in authority as a mark of distinction (Judges v. 10); and the present of an ass seems sometimes to have been accepted by men in authority from their inferiors, probably as a bribe in legal decisions. Hence both Moses and Samuel appear to have vindicated their character as judges by affirming that they had accepted no man's ass. (See Num. xvi. 15, and 1 Sam. xii. 3.) In Asiatic Turkey the present of a horse is still regarded in this light.

The asses of Persia are beautiful animals, having smooth hair, carrying their heads well, and being kept like horses for the saddle, and taught to amble like them. Mr. Morier says in his "Second Journey through Persia" (p. 136), that in Ispahan, in Persia, "the mollahs, or men of the law, are generally to be seen riding about on mules; and they also account it a dignity, and suited to their character, to ride on white asses." This fact is indeed interesting, and it strikingly illustrates what is stated in Judges v. 10, written upwards of 3000 years ago. Hence our Lord's entering Jerusalem riding on an ass (Matt. xxi. 2-11; Mark xi. 1-11; Luke xix. 29-40).

In Egypt these animals are very handsome, and are ridden by the Mohammedans and the most distinguished women in that country. The hotels at Cairo are beset with donkeys and their drivers, who, as soon as a visitor appears in sight, crowd down upon him, and a chorus of voices immediately rises in commendation of them. "Berry good donkey, master!" "Dis your donkey, master!" "Berry handsome donkey, master!" "True, but that donkey will fall down!" "Oh, no, master; go like a steamer." Now the reader will perhaps not forget this fact, that to ride a donkey in Egypt means to gallop one. As soon, therefore, as you are mounted, be prepared; for the animal will be urged forward to his utmost speed. Each driver is always determined to show off the good points of his donkey, and make him take the lead in the race if possible; hence the stick is in constant requisition, and the cries of "*sella*" (quick) are perpetual. It must not, however, be supposed that the Egyptian drivers treat their donkeys with that contempt and cruelty which we are sorry

to say is habitually practised at Margate, Ramsgate, Brighton, Scarborough, and other fashionable watering-places, where there are stands of donkeys for both sexes and all ages; on the contrary, they are not only very proud, but exceedingly fond, of their animals, which they are wise enough to keep in good condition, so that their appearance may really justify their commendations to customers. All have stirrups and wide stuffed saddles covered with carpet.



In its present neglected and despised state the English donkey cannot be compared with that of Egypt, Persia, or other Oriental countries. There is, however, little doubt that if greater care were taken of them in England, if they were better fed and sheltered, and less beaten, in the course of a few generations the breed would be greatly improved; as it is, they are almost entirely abandoned to the tender mercies of the lowest class of people.

Prov. xii. 10, "A righteous man regardeth the life of his beast, but the tender mercies of the wicked are cruel."

As to the charge of stupidity, many anecdotes are on record as to the sagacity of this animal, his attachment to his master, and the willingness with which he works when kindly treated. At Carisbrooke Castle, in the Isle of Wight, there is a donkey—one of the sights of the place—who has been taught to draw water from a very deep well for the use of visitors. The man in attendance, who has no whip—such stimulus being unnecessary—merely says, "Come, sir, show the ladies and gentlemen what you can do." In a moment the donkey steps cheerfully into the inside of the wheel, the rim of which is broad enough to admit the body of the animal, and furnished in the inside with steps formed of projecting pieces of wood, up which the animal walks, turning the wheel by the weight of his own body, and quietly pursues his course, without a word from the man, until he sees the bucket with the water in it appear at the mouth of the well. He then stops, and very deliberately walks out of the wheel, and goes to the place where he is accustomed to stand. The most curious feature in this performance is the observing attitude of the donkey whilst continuing his labour. His head is continually turned towards the well; and this posture is so peculiar, and at the same time apparent, that the question is usually asked by one or other of the spectators, "What is he looking at?" "He is looking for the bucket," replies the man; and the spectators are fully convinced of this when, as the bucket becomes visible, they see the sagacious animal stop of his own accord, leave the wheel, and resume his accustomed standing position, and his usual philosophical and quiet look. Of course the ladies and gentlemen drink the water, praise the animal so unexpectedly clever, fee the man, and leave the well-house fully satisfied in their own minds that there is one donkey in the world, at all events, who is not such a stupid ass as he seems to be. The argument of this anecdote in favour of this despised race becomes still stronger when this fact is added, that it is not one but several asses which have been so employed at

Carisbrooke ; one for fifty, another for forty, the next for thirty, and the fourth for ten years. These dates of service are recorded inside the door of the well-house.

The wild ass (*Asinus onager*) most undoubtedly differs from the domestic variety. It is swifter and more spirited, and varies greatly in the different Oriental countries where it is found, according to their climate and topography. The habits and character of the Arabian variety have been most faithfully and clearly set forth in Job xxxix. 5-8 : "Who hath sent out the wild ass free? or who hath loosed the bands of the wild ass? whose house I have made the wilderness, and the barren land his dwellings. He scorneth the multitude of the city, neither regardeth he the crying of the driver. The range of the mountains is his pasture, and he searcheth after every green thing." The wild ass is referred to in Psalm civ. 11, as quenching his thirst at the stream, and in Isaiah xxxii. 14, Jeremiah xiv. 6, Daniel v. 21, and Hosea viii. 9, as inhabiting deserts and desolate places, and snuffing up the wind.

The food of the wild ass is the prickly succulent plants of the desert, both saline and bitter, belonging to the natural orders Chenopodiaceæ, or goosefoot family, an exceedingly common roadside weed ; and Euphorbiaceæ, or the spurge family, plants having a milky acid juice. These animals are found in great numbers in Arabia Petræa. They are so swift that they soon leave the fleetest Arab horse far behind. They will then suddenly stop, look behind them, and, elevating their noses in the air, snort at their pursuers as if in derision of their efforts to catch them. The only way in which it is at all possible to effect their capture, is by putting fresh relays of dogs and horsemen on the track which they are known to follow, and then hunting them towards the relays, when the fresh horses and dogs at once continue the chase of the already half-exhausted animal. The hunting of the wild ass appears to have been at all times an amusement with the people of the East. According to Mr. Layard, the Arabs sometimes catch the foals of these animals, which are of a light fawn colour, and bring them up with milk in their tents, for the table, the flesh



being esteemed a very great delicacy. The flesh of the wild ass is also eaten in Persia, where also it is hunted, and regarded as a great luxury. The Arabs hunt them, not only for their flesh, but for their hides and hoofs, which they sell to the pedlars at Damascus. "The hoofs furnish materials for rings, which are worn by the peasants on their thumbs, or fastened under the armpits as amulets against rheumatism" (!)* The skins of the wild ass are also made into scabbards for swords and daggers.

Wherever "foal" occurs, either in the Old or New Testament, it has reference to the ass, not the horse.

There are two words used to denote the wild ass. The first is found in Job xxxix. 5 (second part, "bands of the wild ass"), and Dan. v. 21, and the second occurs nine times, Job vi. 5, xi. 12, xxiv. 5, xxxix. 5 (first part, "Who hath sent out the wild ass free?") Ps. civ. 11; Isa. xxxii. 14; Jer. ii. 24, xiv. 6; Hosea viii. 9. This word is always rendered wild ass, except in Gen. xvi. 12, . . . "a wild man," literally a wild-ass man. It is difficult to say what species each word denotes, but besides the *Asinus onager*, probably the *Asinus vulgaris* and the *Asinus hemippus* were included.

It only remains for us to describe in a few words the wild ass itself—a very difficult task, as it varies so much in the different desert places in eastern countries where it is always found. Examine every passage in the Bible in which the wild ass is mentioned, and you will find such spots are either directly or indirectly said to be its habitat or dwelling-place. (See Isa. xxxii. 14; Jer. ii. 24, xiv. 6; Dan. v. 21.) We cannot do better than select as our authority Mr. Morier: "This animal is common to the whole of Persia, although its proper soil is Arabia. It is of a light mouse colour, with a dark streak over its shoulders and down its back. The head is large, but it is much more light and lively than the common ass in its gait. It is of a most obstinate nature, and seems to be extremely refractory under any restraint."† This last feature of its character is certainly alluded to in the words of Job

* See Burckhardt's "Notes on the Bedouins," vol. i., p. 221.

† Morier's "Second Journey through Persia," pp. 200-202.

xi. 12 : "For vain man would be wise, though man be born like a wild ass's colt."



Reader, it is hardly possible to believe how much interesting

natural history is contained in the Scriptures, until you enter this field of inquiry.

The mule is a hybrid, between the horse and ass, differing in size, strength, and beauty, according to the predominance of its parental species. Mules are very useful in mountainous regions, as they are the most sure-footed of all beasts of burden, and so capable of enduring fatigue. In Spain, Portugal, Italy, and the East, this animal is much valued for the saddle and for drawing carriages. It has been thought that they are altogether incapable of producing their kind; but, some few instances have occurred in which female mules have had foals.

Three words in the Old Testament are rendered mule:

(1) The first occurs in sixteen verses; viz., 2 Sam. xiii. 29, xviii. 9; 1 Kings i. 33, 38, 44; x. 25, xviii. 5; 2 Kings v. 17; 1 Chron. xii. 40; 2 Chron. ix. 24; Ezra ii. 66; Neh. vii. 68; Ps. xxxii. 9; Isa. lxvi. 20; Ezek. xxvii. 14; Zech. xiv. 15.

(2) In Esther viii. 10, 14, the true meaning is horses of superior swiftness or superior breed. On the other hand, the word rendered camels in Esther viii. 10, 14, should probably be *mules*.

(3) In Gen. xxxvi. 24, the word rendered mules should be, no doubt, *hot springs*.

THE WILD BOAR (*Sus scrofa*, L.).

This animal belongs to the same order as the horse and the ass (*Pachydermata*). He is unquestionably the original stock from which the domestic pig has descended. In these animals the facial or face bones are much larger than the cranial or skull bones. The skull is of a pyramidal shape; the nose, which has considerable mobility, is greatly elongated, cylindrical, and tapering to its extremity, where it is abruptly truncated. The tip is firm and cartilaginous, and is chiefly employed in turning up the soil in search of roots and other articles of food; in fact, the entire structure of the head is beautifully adapted to the habits of the animal, so that its daily task of penetrating and ploughing up



Wild Boar.

the soil is greatly facilitated. Like the domestic pig, the wild boar is nearly omnivorous, living in woods and forests, generally in marshy grounds, feeding upon roots, herbage, and animal substances, as insects and their larvæ, and even upon carrion.

The wild boar was formerly a native of the forests of Britain, but has long since been extirpated, although at what period is unknown. It is still found wild in the forests of France, Germany, Russia, and other parts of Europe. In all ages, from the days of "Nimrod, the mighty hunter before the Lord" (Gen. x. 9), down to the present time, the chase of the wild boar has been a favourite diversion. He is hunted not only on account of the excellence of his flesh, and the excitement, not unattended with danger, which his chase affords—for dogs, horses, and men have alike sometimes fallen a sacrifice to his fury—but in order to stop the damage which he does to the crops of corn, rice, and grapes in those countries where the vine is cultivated.

The ravages of the wild boar in the vineyards of Palestine are alluded to in Psalm lxxx. 13: "The boar out of the wood doth waste it, and the wild beast of the field doth devour it." In Greece, where the grape vine is grown, "it is the custom of wild boars to frequent the vineyards, and to devour the grapes;" and the havoc which one wild boar is capable of effecting in a single night is astonishing. What with eating and trampling under foot, he will destroy a vast quantity of grapes. (Rev. J. Hartley's "Researches in Greece," p. 234.) In the *Ghor*, a long, continuous depression or ravine, through which the Jordan flows, the wild boar is very common, so that "the Arabs of the valley are unable to cultivate the common barley on account of the eagerness with which the wild swine feed upon it: they are therefore obliged to grow a less esteemed sort, which the swine do not touch."*

Besides Psalm lxxx. 13, the word swine occurs six times in the Old Testament, viz., Lev. xi. 7, Deut. xiv. 8, Prov. xi. 22, Isa. lxxv. 4, lxvi. 3, 17, where it is chiefly referred to as an unclean

* Burckhardt's "Syria," p. 278.

animal. In the New Testament also the animal is frequently mentioned, as in Matt. vii. 6, 2 Pet. ii. 22, etc.

Palestine is included within the geographical area over which the vine has spread itself, and within which it is capable of culture in the open air. Wild boars are still found there, and in the adjacent countries of Asia Minor ; and as they have not changed their nature, they still commit, even to-day, the same ravages in its vineyards as in the days of David.

The hog was introduced to the New World by Columbus, who took him to St. Domingo in 1493 ; from this island he was taken to the mainland, where the race soon multiplied so rapidly that wild hogs, in less than half a century, were spread from the 25th north parallel to the 40th south. In the West India Islands they were killed in great numbers, on account of the injury done by them to the sugar-cane plantations. Their ravages were like those of the wild boars in the vineyards of Palestine.

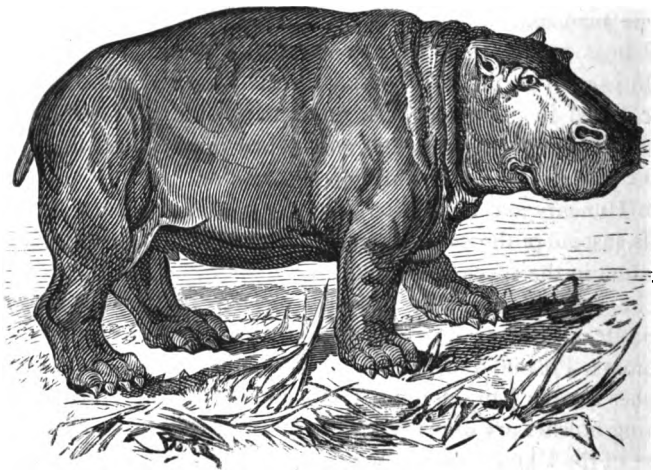
In Hungary and in Sweden there are breeds of swine with solid hoofs, instead of the usual cloven ones, which is a most remarkable variation in the species.

The stiff glossy hairs growing on the backs of wild and domestic swine are imported into this country from Germany, Denmark, Poland, and Russia, and used in the manufacture of brushes for the hair, clothing, teeth, and nails. Pigs' bristles for making brushes are obtained chiefly from the wild boars of Russia, those of the Ukraine being most esteemed. Bristles are of various colours, black, grey, and yellow ; but the kind called the lily, on account of its silvery whiteness, is the most valued, and is chiefly used for tooth brushes, shaving brushes, and the softer description of hair brushes.

Almost any kind of animal may be taught to do something, if only a sufficient amount of care has been bestowed upon its training ; and a pig is no exception. Some of them have been taught to perform curious tricks, and have been shown as learned pigs.

The *Behemoth*, or river horse (*Hippopotamus amphibius*, L.),

belongs to the natural order *Pachydermata*, or thick-skinned animals, and is somewhat allied to the elephant, common American tapir, and pig. It is a native of the Nile and other African rivers, feeding entirely upon the vegetable substances growing upon their banks, and occasionally intruding itself into cultivated ground, where it sometimes destroys whole plantations to satisfy the wants of its enormous fabric. It resembles in its general aspect a gigantic pig. The head is very large, the greater part of it being made up of the facial bones, which are of enormous



The Hippopotamus.

size when compared with those of the cranium; the eyes are small and situated high in the head, so that with the whole of its body submerged in the water, the animal can look around and breathe, by raising only a small portion of the head above its surface. Its legs are very short and stout, and the hide is of enormous thickness, being two inches deep or more on the back and sides. The males, according to travellers, obtain a length of fourteen or fifteen feet. When not irritated, these monsters are quiet and inoffensive,

but show great fury when attacked, and, as if conscious of their strength, will sometimes even become the assailant when slightly provoked. All these physical features are clearly referred to in the description of the behemoth recorded in Job xl. 15-24: "Behold now behemoth, which I made with thee; he eateth grass as an ox. Lo now, his strength is in his loins, and his force is in the navel of his belly. He moveth his tail like a cedar: the sinews of his thighs are firmly woven together. His bones are as strong pieces of brass; his bones are like bars of iron. He is the chief of the ways of God: He that made him gave him his sword (*i.e.* his teeth). Surely the mountains bring him forth food, where all the beasts of the field play. He lieth under the shady trees, in the covert of the reed, and fens. The shady trees cover him with their shadow, the willows of the brook compass him about. Behold, a river swelleth proudly, he is not afraid; he is confident, though a Jordan burst forth against his mouth. Will any take him in his sight, or bore his nose with a gin?"

As ivory is referred to so frequently in the Old Testament, viz., in 1 Kings x. 18; Ps. xlv. 8; Solomon's Song v. 14, and vii. 4; Ezek. xxvii. 6 and 15; Amos iii. 15, and vi. 4; the very word for ivory in 1 Kings x. 22 probably meaning "teeth of elephants," an Indian word for elephants being found in this passage; and as we have good reason for believing that the ivory, apes, and peacocks mentioned, were brought from India, it may be allowable to introduce here a description of

THE INDIAN ELEPHANT (*Elephas Indicus*).

The Indian Elephant is the largest of the terrestrial Mammalia, the height of its back being upwards of twelve feet from the ground. The enormous weight of its body is sustained by legs of the most solid columnar construction, the joints being so formed that each bone rests vertically upon the one beneath it. The feet are furnished with five flat hoofs, corresponding with the five toes which

are distinct in the skeleton, although concealed by the skin, which is naked, with the exception of a few bristles in particular parts and at the tip of the short tapering tail. The ears are large, hanging down upon the sides of the head. The upper jaw acquires a pair of tusks, which, projecting downwards, grow from a permanent pulp, and continue to increase in size during the life of the animal, acquiring in the males an enormous size. These tusks are useful, not only as weapons of offence and defence, but also to root up small trees, and tear down the branches of larger ones, upon the foliage of which the elephant browses, thus making a passage for its bulky body through the tangled forest. The only other teeth possessed by the elephant consist of two molars on each side of each jaw. These molars are composed of three substances of different degrees of hardness, viz., the ordinary substance of the teeth (dentine), a much harder substance called enamel, which coats the dentine, and is arranged on the broad upper surface of the tooth in alternating vertical plates, and the cement, a material softer than either, which serves to unite the plates. This arrangement makes good the wear and tear, so that these grinders, having a surface which wears unequally, the most valuable property of a mill-stone is thus mechanically secured. The molar teeth, like the tusks, grow during the life of the elephant from a permanent pulp, only not one but a succession of teeth are produced, the hindmost taking the place of those before them which have been worn out or abraded by use, as soon as they are cast off as unserviceable.

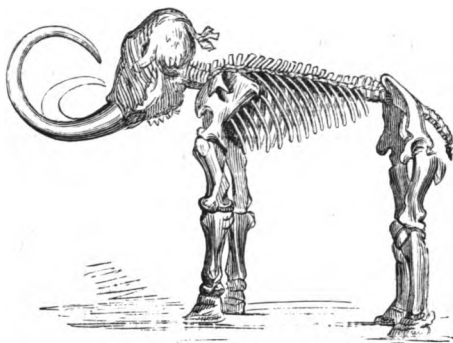
Not less admirable is the construction of the elephant's trunk, which is only the nose or snout enormously prolonged, and principally composed of 40,000 or more muscles interlaced in every direction, which gives it a most extraordinary degree of flexibility and sensibility, so that the elephant can alike with this wonderful instrument either pick up a needle, or tear up the trunk of a tree. These noble animals live in herds in the luxuriant forests of the tropics, and from the earliest ages have been brought into subjection to man, to whom they are especially valuable, owing to their

vast strength, docility, and intelligence. The elephant is mentioned in the two books of Maccabees ; and some writers have even thought the behemoth of Scripture to be the elephant, or some extinct pachydermatous animal as the mammoth. This last opinion was actually maintained by a well-known English writer on Job in the last century, Dr. Mason Good.

Professor Owen, in his work on the fossil mammalia of England, describes and figures the remains of the hippopotamus, mammoth or fossil elephant, mastodon, and rhinoceros, which have been found in the superficial unstratified deposits of this country ; their bones also are sometimes found in the seas which encircle our shores.

THE MAMMOTH (*Elephas primogenius*).

This is an extinct species of elephant, which appears to have inhabited the most northern parts of the Asiatic continent at a



Skeleton of the Mammoth.

comparatively recent period. The entire carcase of a Mammoth was discovered in 1799, frozen in the ice and gravel at the mouth of the river Lena, in Siberia, and so well preserved by the ice, that on its melting, the flesh, as it became exposed, was devoured

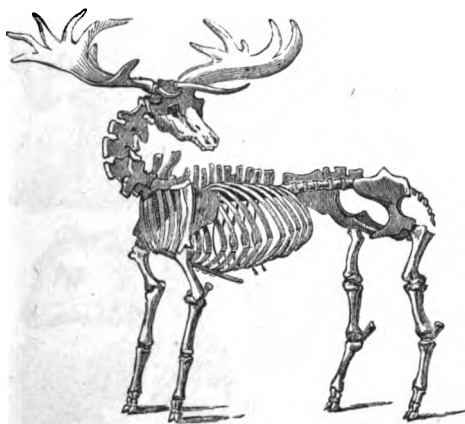
by wolves and bears. The head was covered with dried skin, and the pupil of the eye was still to be distinguished ; the tusks were present, which were nine feet six inches in length, and one of the ears was entire ; the brain was in the skull, but somewhat dried. The entire skeleton was there, with the exception of a fore-leg, the bones being still held together by ligaments and portions of skin. The neck was covered with a long mane, and the entire skin with a double garment of coarse hair and reddish wool. According to Mr. Adams, who visited the animal in 1806, and carefully collected the remains, more than thirty pounds of hair and wool were gathered from the wet sand, into which it had been trodden by the bears and wolves whilst devouring the flesh. The Emperor of Russia purchased the skeleton, which is now in the Museum at St. Petersburg. The height of this remarkable animal is about nine feet, and its entire length to the tip of the tail, about sixteen feet. A sketch of it is given above.

We learn from Bishop Heber that in some of the colder and more mountainous districts of northern India, hairy elephants still exist ; this fact, taken in common with the warm and shaggy coat of the Siberian mammoth, would seem to indicate that the animal once lived and roamed in the country in which its remains were found, and probably at a period when the climate was much colder than it is at present.

THE IRISH ELK (*Megaceros Hibernicus*).

This extinct elk,—the bones of which have been found in the Isle of Man and in different parts of England, such as Norfolk, Essex, and Lancashire, but nowhere to the extent to which they occur in Ireland, in the shell marl, below the peat or bog earth,—was an immense creature, and much larger than any species now living. Specimens have been found, of which one now in the Museum of the Royal Society, Dublin, measured, from the foot to the summit of the antlers, ten feet and four inches, while the measurement between the extreme tips of the antlers is eleven

feet ten inches. The horns are very wide, and from being flattened out, as in the elk or moose, the animal is regarded by naturalists as a fossil or extinct variety of the moose deer now living. To support these immense horns, the vertebræ of the neck are much larger and stronger than in any existing species of deer, whilst the legs are stronger in proportion. The female was hornless, as in our fallow deer and red stag. The length of the body, estimated by that of the spine, is ten feet ten inches. It is most probable



Skeleton of the Irish Elk.

that this gigantic animal became extinct before the introduction of man into the British islands.

The bones of the *Megaceros* are generally of a dark-brown colour, with patches of the blue phosphate of iron ; and, in some instances, the hollows of the long bones have contained marrow so fresh as almost to resemble suet.

THE CONEY (*Hyrax Syriacus*).

This animal is the shaphan of the Hebrews, incorrectly translated coney or rabbit in our version of the Bible, and with it we

conclude the order Pachydermata, to which it certainly belongs. Naturalists are agreed that no coney or rabbit has yet been found in Palestine. This little animal is rather larger than the common rabbit, to which it has a superficial resemblance in appearance, whilst it has many of its habits. Nevertheless, its skeleton closely



The Hyrax.

resembles that of a miniature rhinoceros. It is entirely covered with brown fur, has short legs, with four toes on its anterior and three toes on its posterior feet, all furnished with flat hoof-like nails. The tail is entirely wanting. The incisor or cutting teeth are six in number, two being in the upper and four in the lower

jaw ; they are long and curved, with sharp and chisel-edged tips, and as there are no canines, but only molars, with the usual naked interval of jaw between the two, these animals certainly approach the rodentia in these structural peculiarities ; but it must be added that the molar teeth closely resemble those of the rhinoceros in form and structure, a pachydermatous animal.

The Hyracidæ are active, wary animals, running about among the rocks, in the holes and clefts of which they conceal themselves upon the least alarm. The Hyrax Syriacus is an inhabitant both of Arabia and Syria. It lives upon the young shoots of shrubs, herbs, and grass, is playful in its habits, and docile and familiar in captivity.

The coney is mentioned several times in the Bible. Its rock-loving habits are alluded to in Psalm civ. 18, "The high hills are a refuge for the wild goats, and the rocks for the conies ;" Prov. xxx. 26, "The conies are but a feeble folk, yet make they their houses in the rocks." In Lev. xi. 5, Deut. xiv. 7, this animal is declared unclean, and accordingly its flesh was not eaten by the Israelites. The remarks already made in reference to the hare are equally applicable to the hyrax. (See above, pp. 91, 92.)

The coney is a very watchful creature, usually feeding on the summit of a rock, not far from its hole or burrow, which commands a good view of the surrounding country. It is so wary that it never enters a trap or snare, and is with the very greatest difficulty shot by the hunter, and is still found in districts from which other wild animals have been long exterminated. To this excessive caution there is distinct reference in Prov. xxx. 24, where the coney is classed among the "four things which are little upon the earth, but they are exceeding wise."

CHAPTER II.

THE BIRDS = AVES.

ORDER I.—RAPTORES, OR BIRDS OF PREY.



THESE birds are distinguished by their strong, curved, and sharp-pointed beak, short robust legs, and foot furnished with three toes before and one behind, armed with strong, recurved, sharp talons, adapted for seizing and tearing, with a bill to correspond, which is strong, sharp, and hooked, capable of cutting and dividing like a knife.

This order has been arranged into three families, the Falcons, Vultures, and Owls.

I. FALCONIDÆ, OR FALCONS.

This family includes the Eagles, Falcons, and Hawks, which have their head, neck, and feet covered with feathers, and feed upon the flesh of animals recently killed.

THE GOLDEN EAGLE (*Aquila Chrysaetos*).

This bird is indigenous to Palestine, and frequently seen there. Not only are these birds among the most widely spread of all the feathered inhabitants of the air, but they are everywhere regarded as the emblem of might and courage, of empire and victory.

The ancient and modern popularity of the eagle is easily explained. Its bold and majestic appearance, immense size and strength, the height to which it soars in the heavens, the grandeur

of its mountain home, the rapidity with which it darts down upon its prey, have all tended to its elevation in the estimation of mankind. Hence both ancient and modern nations have adopted the eagle, and portrayed it on their national banner as the symbol of



The Golden Eagle.

their own power and daring. And yet it is well known to naturalists that the eagle is far inferior in courage to some of the smaller predaceous birds, as the falcons. The peregrine falcon, for example, will drive him from the neighbourhood of her nest, and

even the little sparrow-hawk will sometimes strike at his gigantic relative.

Our American cousins are somewhat unfortunate in their choice of the white-headed or bald eagle (*Pandion haliaetus*) for their national emblem, as he does not deserve that honour. He is very fond of fish, and to procure it attacks and robs the osprey, or fish-hawk. Watching the industrious osprey from some lofty tree or



The Osprey.

rock commanding a view of the shore and ocean, as soon as he sees the osprey emerge from the water with his finny prey he is off in pursuit, and, attacking the fish-hawk thus encumbered, and flying to the shore, compels him to drop his fish, which he does with a scream, the eagle dexterously seizing it before it reaches the water. These scenes are of daily occurrence along the Atlantic seaboard. This fact was well known to Dr. Franklin and Audubon. Both these naturalists regretted that this bird should have been

selected; indeed, it is said that Dr. Franklin opposed the selection. Audubon quotes the following passage from a letter which he received from Franklin on the subject, who thus quaintly expresses himself: "For my part, I wish the bald eagle had not been chosen as the representative of our country. He is a bird of bad moral character. He does not get his living honestly."

It is nevertheless quite true that the eagle is the king of birds, and holds amongst them deservedly a pre-eminent position, similar to that held by the lion amongst animals. But the noble nature of the eagle, like that of the lion, is wholly imaginary, since he is completely under the dominion of his cruel and carnivorous appetite, attacking only the weaker animals, and when victorious, gorging himself like a glutton.

The golden eagle is a large bird, measuring about three feet in length, and from seven to eight feet in extent of wing. Its colour is deep umber brown, glossed with purple on the back and wings. The feathers on the head, back of the neck, and in front of the thighs and shoulders are somewhat paler, inclining to orange colour, and when shone upon by the sun, or in a strong light, have a brilliant golden appearance, whence the name of the bird is derived.

The nest, or eyrie, as it is called, of the golden eagle, is built upon the ledges of inaccessible rocks, and generally out of the reach of shot, whether from above or below. It is composed of very rough materials, as masses of sticks and roots of heather entangled with each other, but without any lining in the inside. The eggs are usually two in number, of a whitish colour, with pale brown or purplish spots, especially towards the larger end. His food consists chiefly of the flesh of birds and of the smaller animals, as hares, rabbits, lambs, turkeys, and every kind of wild and domestic fowl, which he captures and kills for himself. The popular belief that the eagle will eat no meat unless he has killed it himself is quite a mistake; for it is a well-known fact in the Highlands of Scotland, where this bird is still to be found, that the golden eagle does not disdain a meal upon the carcase of a sheep

or other large animal which may be exposed upon the hills, and is not unfrequently lured to his own destruction by its exposure as a bait in the neighbourhood of a pit, in which the sportsman lies concealed with his gun. In winter, when food is scarce, he will even soil his beak with carrion, associating with flocks of vultures and other unclean birds.

So great is the quantity of food collected by these birds when rearing their young, that a poor man in the county of Kerry got a comfortable living for his family during a time of famine by robbing an eagle's nest. A similar occurrence took place at Glenariff, in the county of Antrim, where a pair of eaglets, taken from a nest, were so placed as to be easily accessible to their parents, who supplied them with so great a quantity of rabbits and hares, that their owner obtained a sufficiency for himself and family, as well as enough for the eaglets. The boldness of this eagle as a domestic provider is also quite as remarkable as his industry. He has been known to follow a chase, and after hovering over the hunters for some time, whilst the pack were at full cry, at length outspeed them in his flight, and when between three and four hundred paces ahead, suddenly dart downwards, seize their hare, and off with it, thus bringing their sport to an abrupt and inglorious termination! In like manner he swoops down on grouse in the Highlands, and, in the very face of the hunter and his dogs, robs them of their grouse before they have time to recover themselves from their astonishment at an attack so novel and unexpected.

The sight of the golden eagle is keen, and his flight lofty. From his mountain eyrie he soars upwards towards the sun, gazing on his brightness with undimmed eye; the landscape is spread out beneath him like a panorama, and his ever-watchful eye is now quick to discern the living prey below. He sees it, then like lightning leaves the clouds, strikes into its agonised body his sharp curved talons, drinks the blood warm gushing from the arteries and veins of the expiring victim, and triumphantly bears it aloft as food for his mate and the young eaglets. The eagle in

making these attacks invariably seizes his prey with his talons, the beak being afterwards used for the purpose of tearing it up. His hunger and thirst and that of his family appeased, the royal bird folds up his wings in dignified tranquillity, and, sitting in serene and solitary state on the cliff in the neighbourhood of his eyrie, watches the sun as he sets behind the mountains.

The golden eagle is now restricted in this country to the wildest and most central parts of the Highlands of Scotland, where he is every year becoming scarcer, and will soon become extinct. His eyries have long disappeared from Derbyshire, the mountainous parts of Wales, and the precipices of Cumberland and Westmoreland. He is a most inconvenient neighbour, especially to the Highlander during the lambing season, when he usually requires a large supply for his young; besides, he is not particular, and has been known to attack young children, and carry them off to his eyrie. Now such work as this cannot be allowed, and however the naturalist, whom these birds have never injured, may lament the war of extermination which is being carried on, he cannot blame the Highlander or the sportsman. There cannot be a doubt as to the picturesque appearance of this mountain bird, and that he perfectly represents the sublime rude grandeur of Highland alpine elevations. There he sits, perched on some lofty inaccessible rock, motionless and statue-like, unconcerned, although the wind and rain-storm may be sweeping up with tremendous power from the ravines below, and apparently unobserving. The shepherd and sportsman, deceived by this seeming disregard, are toiling upwards and trying to get, if possible, within rifle-shot. But his keen, stern eye is watching every movement. The convenient and coveted spot is nearly gained. And now the bird has left the rock, and is sailing majestically away for life and liberty.

We have shown how amply the young eaglets are provided for. When sufficiently strong, they are compelled to leave the nest, and taught to fly. Sir Humphrey Davy thus narrates the lesson given to the eaglets: "I once saw a very interesting sight above the crags of Ben Nevis, as I was going in the pursuit of black game. Two parent eagles were teaching their offspring—two young birds

—the manoeuvres of flight. They began by rising from the top of the mountain in the eye of the sun. It was about mid-day, and bright for this climate. They at first made small circles, and the young birds imitated them. They paused on their wings, waiting till they had made their first flight, and then took a second and larger gyration, always ascending, and enlarging their circle of flight, so as to make a spiral. The young ones slowly followed, flying better as they mounted, still rising, till they became mere points in the air, and the young ones were lost, and afterwards their parents, to our aching sight."

The eagle is familiar to us in connection with many passages of Scripture. There is good reason for believing that usually the sacred writer had in mind a different bird (the griffon vulture); but in many instances the allusions are altogether general; and the above description of the golden eagle embraces all the characteristics to which reference is made.

1. The carnivorous propensities of the eagle and her young ones are referred to; the place where she builds her nest, and her keenness of sight, (Job xxxix. 27-30,) "Doth the eagle mount up at thy command, and make her nest on high? She dwelleth and abideth on the rock, upon the crag of the rock and the strong place. From thence she seeketh the prey, and her eyes behold afar off. Her young ones also suck up blood; and where the slain are, there is she." (See also Jer. xlix. 16.) 2. Reference is made to the upward flight of the eagle and to its swiftness, (Isaiah xl. 31,) "They shall mount up with wings as eagles;" also Prov. xxiii. 5: "For riches certainly make themselves wings; they fly away as an eagle toward heaven." "Our persecutors are swifter than the eagles of heaven" (Lamentations iv. 19).

The osprey, mentioned in Lev. xi. 13, Deut. xiv. 12, is either the *Pandion haliaëtus*, or the short-toed eagle (*Circæetus gallicus*), found in the south of Europe, the genus being well known in India as a destroyer of snakes and lizards.

THE KITE (*Milvus regalis*).

The Kites are found in all parts of the world, but more abundantly in warm than in temperate climates. These birds are



The Kite.

easily recognised by their circular flight, and their power of hovering in the air, or remaining for a long time apparently almost motionless, suspended upon the wing over one particular spot, often at such a height as to be nearly invisible. From this lofty elevation the eye of this bird commands a wide extent of landscape, and like that of the eagle, looking below, is quick to discern its prey, generally some of the smaller birds, mammalia, or even fish,

which it skims as it were from the surface of the earth, or the water, and bears away in its talons.

The kite is rather a large bird, the male measuring twenty-five, and the female about twenty-seven inches in length, and about five feet in extent of wing. The nest is usually formed in the forked branch of a tree, in some thick wood, and consists of plenty of small sticks thickly matted together, and lined in the interior with wool, or some other soft, warm material. The eggs are generally three or four in number, their colour white, with a few reddish-brown spots on the larger end.

In Lev. xi. 14, Deut. xiv. 13, we find the vulture and the kite mentioned amongst the birds that the Jews were forbidden to eat. The Hebrew word here rendered *kite* is *ayyah*, which occurs in one other passage, Job xxviii. 7: "There is a path which no fowl knoweth, and which the vulture's eye hath not seen." Our translators have here preferred *vulture*, but the kite is really meant; and as the reference is to keen, piercing sight, nothing could be more appropriate than the allusion to this bird.

Another Hebrew word (*dayyah*) is rendered *vulture* in Deut. xiv. 13, and Isaiah xxxiv. 15, and a word substantially the same occurs in Lev. xi. 14. Here also some species of kite is probably intended, perhaps the black kite (*Milvus niger*), or else the buzzard, or possibly the falcon.

One of the birds mentioned in Deut. xiv. 13 is the glede. This English word (derived by Dr. Carpenter from the verb *to glide*, in allusion to the nature of its motion) is a common name for the kite in certain parts of England. The Hebrew word signifies either kite or buzzard.

THE HAWK (*Accipiter nisus*).

This bird is mentioned three times in the Bible; viz., in Lev. xi. 16, and Deut. xiv. 15, where it is forbidden as food, and in Job xxxix. 26, where its migratory instinct is alluded to. As it is impossible to determine the particular species to which reference is made, if we select one or two common hawks in Palestine,

the reader may feel pretty well satisfied that we have the correct one.

The sparrow-hawk (*Accipiter nisus*) is very common in the Holy Land. These are elegant, slender birds, which, like kites, are very generally distributed over the face of the globe, but differ



The Sparrow Hawk.

from them in their habit of flying low, which they do with arrow-like velocity over the face of the ground. The hawk preys upon all the small birds, whom he holds in continual terror,—upon chickens, pigeons, partridges, field mice, moles, leverets, and young rabbits. Every farmer and game-keeper is therefore his sworn foe. No bird is bolder and more pertinacious in the pursuit of its prey, following it even through an open window, into rooms and churches, undeterred by the presence of man.

The sparrow-hawk makes a small, flat, rude nest of twigs, in a tree or thorny bush, lined with a small quantity of some softer

material. Sometimes it will occupy the deserted nest of a crow or magpie, and in countries destitute of wood, will nestle upon the rocks. The eggs are of large size, spotted, and four or five in number. As is generally the case with birds, the female is much larger than the male; the former, in this case, measures fifteen inches in length, whilst the latter measures only twelve.

There are also several species of harrier-hawks in Palestine, of which two, the common blue harrier (*Circus cyaneus*), and the marsh harrier, *Circus aeruginosus*, (Greek *kirkos*, a kind of hawk, and Lat. *aeruginosus*, rusty,) are indigenous to this country. These birds roost or nestle on the ground, over which they gently fly at a small elevation, beating every portion of its surface like a dog hunting for game. To this habit they owe their name of harriers. Their nest consists only of a few sticks, with a slight lining of grass, and the eggs are usually three or four in number. Occasionally, however, the nest is raised a little above the ground, amongst the reeds and ferns. The marsh harrier feeds upon water-birds, water-rats, frogs, water-lizards, and fish, which it surprises by its noiseless flight. These birds remain with us during the summer months, and on the approach of winter migrate to warmer climates, where the reptiles, upon which they principally feed, still continue active. It is to this feature in their character,—that wisdom which directs their flight for food further to the south when it becomes scarce in the north, which man does not give them,—to which God directs Job's attention in the words, (Job xxxix. 26,) "Doth the hawk fly by thy wisdom, and stretch her wings toward the south?"

It is very probable that the word hawk, as used in the Bible, is intended to include others of the smaller birds of prey, as the kestrel and falcon.

2. VULTURIDÆ, OR VULTURES.

This family of birds differs from the falconidæ, which have their head-quarters in the cold and temperate regions of the earth, in being inhabitants mainly of warm climates, where they feed, not

upon a living, but a dead prey. The vulturidæ are carrion birds, and may be enumerated among the cleansers, appointed by the Creator to remove the decomposing bodies of dead animals from warm countries, which would otherwise empoison the purity of the atmosphere. They are for the most part natives of the mountains,



The Vulture.

their abodes being sometimes on the margin of perpetual snow. In the vulturidæ, the head, neck, and tarsi are all bare of feathers, or clothed with a sort of woolly down.

The ossifrage, mentioned in Lev. xi. 13, Deut. xiv. 12, denotes the LAMMERGEIER, *Gypætus barbatus*, (Greek, *gyps*, a vulture, *aëtos*, an eagle,) or the bearded or griffin vulture, fully equals

the largest eagle in size, measuring four feet and a half in length, and between nine and ten feet in the expanse of its wings. The head and neck are covered with feathers, and in this respect it approaches the eagles and differs from the other vultures. It is an inhabitant of the high mountains of Switzerland, Germany, and of Western Asia, and is spread over the Holy Land. It is a solitary bird, not gregarious like the ordinary vultures. The lammergeier feeds, like other vultures, on the flesh of dead animals, but in addition finishes its repast by breaking the bones and eating the marrow. It breaks them by dropping them on some piece of rock from an immense height in the atmosphere, and for this



The Bearded Griffon.

reason it has received the name of Ossifrage, or bone-breaker. Tortoises are often broken by the bird in this way, and snakes killed in the same manner.

Our young readers will understand now why this bird has such large and powerful wings ; in order that it may be enabled to keep afloat in the attenuated atmosphere into which it is compelled to soar, to ensure the necessary fracture of its prey by its fall.

The gier-eagle (Lev. xi. 18, Deut. xiv. 17) is the EGYPTIAN VULTURE, *Neophron percnopterus*, (Greek, *percnos*, black, dusky, and *pteron*, a wing,) very common in Egypt, and called by the Europeans at Cairo, Pharaoh's hen. These birds are never molested by the natives, on account of their services in clearing

the carrion and other filth. They roost on the trees in their neighbourhood, and on the fences which form the enclosures for cattle. These vultures are not very large birds, being equal in size to a raven. Their colour is white, with the exception of the quill feathers, which are a dark brown.

We must not suppose however that the four verses which have just been quoted are the only passages in which the vulture is mentioned. There can be no doubt that where the word eagle occurs in our authorised version, the vulture is usually the bird intended. Thus, in Matt. xxiv. 28, "Whosoever the carcase is, there will the eagles be gathered together," vultures are plainly alluded to, for these only are gregarious. Again, in Micah i. 16, "Make thee bald, and poll thee for thy delicate children; enlarge thy baldness as the eagle; for they are gone into captivity from thee;" reference is clearly made to the featherless head of the vulture.

It is then by no means improbable that the word rendered eagle, *nesher*, usually denotes the majestic griffin vulture, a bird very common in Palestine, and to this day known by a name almost identical with the Hebrew word. This word occurs twenty-eight times in the Old Testament; viz., in Exod. xix. 4; Lev. xi. 13; Deut. xiv. 12, xxviii. 49, xxxii. 11; 2 Sam. i. 23; Job ix. 26; Psalm ciii. 5; Prov. xxx. 17, 19; Jer. iv. 13, xlviii. 40, xlix. 22; Ezek. i. 10, x. 14, xvii. 3, 7; Hosea viii. 1; Obad. 4; Hab. i. 8; Dan. iv. 33, vii. 4; besides the places already quoted. The same explanation applies to the New Testament, especially in Matt. xxiv. 28, and Luke xvii. 37; Rev. iv. 7, xii. 14, are less clear.

3. THE STRIGIDÆ, OR TRUE OWLS.

These are nocturnal birds of prey, which sally forth in the dusk of the evening, with eyes eminently adapted to the diminished light, large and staring, and plumage so soft and downy as to render their flight through the dusky evening air perfectly inaudi-

ble. The pupils of the eyes are large, in order to admit as much of the scanty light of evening as possible, and the apparatus of flight is feeble, because these birds are not intended to obtain their prey by superior swiftness of wing, but by stealthiness of approach. The head and ears of the owl are both large. The bill is short, compressed, curved, and hooked at the tip; the legs short, stout, and powerful, and the toes armed with strong acute claws.

These predaceous birds are thus organised in the most perfect and admirable manner for the capture and pursuit of prey by twilight; and as this consists principally of noxious animals, such as mice and rats, the owls should be placed among the number of our friends, instead of being looked upon, as they are by the uneducated and superstitious, as birds of evil omen. It must be admitted that their voices are none of the sweetest, and the peasant who hears the owl shrieking in the churchyard, from the ivy-mantled tower of the village church, or from a solitary rock or ruin, at the midnight hour, when every other sound is hushed, may well be excused for feeling some little awe on the occasion.

This family of predaceous birds, or at least that portion of it in which we are especially interested, consists of:—1. The Strigidæ, or True Owls, in which the head is smooth, and destitute of horn-like tufts of feathers, and the eyes are surrounded by two conical disks of white and shining feathers, at the bottom of which they are placed, which doubtless serve to cause the feeble rays, by the aid of which these birds hunt their prey at night, to fall with more power upon their organ of vision. We have an excellent example of this in the common screech or barn owl (*Strix flammea*). 2. The Bubonidæ, or Horned Owls, where the disks around the eyes are still large, but in which the head is furnished with two feathery tufts resembling horns. It is among the horned owls that we find the largest birds of this family. The great eagle owl (*Bubo maximus*) is but little inferior in size to the golden eagle, and is rendered very remarkable in its appearance by the long horn-like tufts of feathers with which its head is adorned. There

are other species in America, as *Bubo virginianus*, but with this we have nothing to do, as it may be laid down as a safe principle in Bible zoology, that all the animals referred to in the Scriptures are Old World animals. The New World was not discovered at the time they were written.

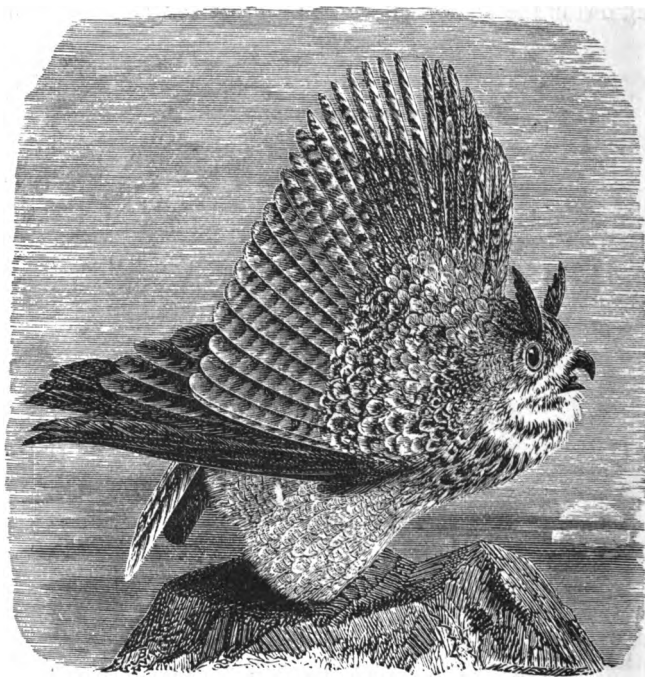
There are five different Hebrew words which have been translated owl in the authorised version. (1) *Cos*, which occurs three



The Barn Owl.

times, and is rendered "little owl," Lev. xi. 17, and Deut. xiv. 16, where we find it prohibited as food; "owl," in Psalm cii. 6. Some think this to be the "little owl" (*Athene persica*). The genus *Athene* (so called from the Greek goddess Athene, to whom the owl was sacred) is confined to warm climates. Others say the great horned owl (*Bubo maximus*); others, the com-

monest of our native species, the screech or barn owl (*Strix flammea*). (2) *Yanshuph*, translated "great owl" in Lev. xi. 17, and Deut. xiv. 16; "owl" in Isaiah xxxiv. 11. Most probably the Egyptian horned or eagle owl (*Bubo ascalaphus*), a bird closely allied to the great horned or eagle owl of Europe (*Bubo*



The Horned Owl.

maximus), and very plentiful in Egypt, among the ruins of that country, and in Palestine. (3) *Lilith* occurs Isaiah xxxiv. 14, where it is translated screech owl. Perhaps the hooting or tawny owl (*Syrnium stridula*), or the common barn owl (*Strix flammea*). (4) *Kippoz* occurs Isa. xxxiv. 15, where it is translated "great

owl." All we can say is, that it is some kind of owl. (5) *Bathyaanah* occurs eight times; viz., Lev. xi. 16; Deut. xiv. 15; Job xxx. 29; Isa. xlii. 21, xxxiv. 13, and xliii. 20; Jer. l. 39, and Micah i. 8. This word is always rendered owl in the text, but really means ostrich, which is sometimes found in the margin. On referring to the passage in Job xxx. 29, "I am a brother to dragons and a companion to owls," the reader will see that the word owls is rendered "ostriches" in the marginal reading. It is the same with Isa. xliii. 20: "The beast of the field shall honour me, the dragons and the owls" (ostriches in marginal reading). See also Isaiah xlii. 21: "But wild beasts of the desert shall lie there, and their houses shall be full of doleful creatures, and owls shall dwell there" (ostriches in marginal reading). This word has therefore been wrongly translated, and the correction of the text has been made in the marginal reading.

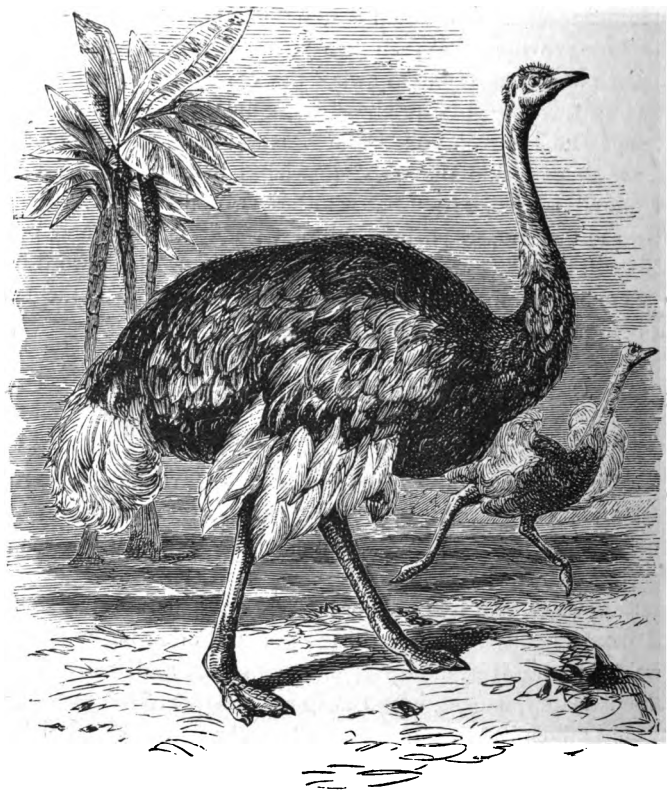
ORDER II.—CURSORES, OR RUNNING BIRDS.

THE OSTRICH, OR CAMEL-BIRD (*Struthio camelus*, L.).

This bird is indigenous to northern central Africa and Arabia. It shuns the presence of man, preferring the solitude of the desert, where it lives in large flocks, feeding upon such scanty herbage and grass as the desert furnishes, and is so easily satisfied with regard to water, that it is frequently met with in its most parched and desolate tracts, which even the lion and other beasts of prey have deserted. It is, however, very voracious, and will swallow, indiscriminately, stones, wood, leather, and pieces of metal; on the same principle, however, as a fowl swallows gravel, to assist the action of the gizzard in the trituration (Lat. *tritura*, a grinding) of its food.

The ostrich belongs to the tribe of Cursorial or running birds, which are totally destitute of the power of flight, having rudimentary wings, and the sternum reduced to a simple convex shield, without any trace of a keel, which in other birds is largely developed, as a basis for the attachment of the powerful muscles which

move the wings. This deficiency of wing is, however, to some extent compensated by the great size and muscularity of the legs, by which they are enabled to run with such rapidity as speedily to



The Ostrich.

outstrip the fleetest horse, so that the hunters can only effect their capture by approaching them from several directions, and thus bewildering them in their efforts to escape. This pursuit is not unattended with danger ; for the ostrich, when driven to extremi-

ties, will sometimes turn upon its pursuers, attacking them with great fury, and inflicting dreadful wounds with its feet and claws. When running, the wings are spread out on either side of the body, and to some extent accelerate the speed. When in full flight, according to Dr. Livingstone, you can no more see their legs than the rapidly revolving spokes of a cart-wheel.

The foot of the ostrich consists of two toes only, one much larger than the other, each armed at the extremity with a strong nail, and well padded beneath. The ostrich is hunted chiefly for its feathers, which are very valuable, being both elegant and ornamental. This is owing to the length and slenderness of the shaft, and also of the barbs and barbules, the latter being dis-



Foot of the Ostrich.

united, and so constituting the form of feather known as a plume. Ostrich feathers, dyed black, are sold to undertakers for mourning plumes, a full set being worth from £200 to £300. The fine white ones are first scoured with soap and then bleached; thus prepared they are worth from seven to eight guineas a pound. The feathers from the back and above the wings are the best; next, those of the wings and tail. The head and neck of the ostrich are nearly naked, and its plumage generally is very lax.

The flesh of the ostrich, when young, is not to be despised, and its eggs are considered a great delicacy. Ostrich eggs are usually prepared by being roasted in hot ashes. When taken fresh from the nest, they are wholesome but somewhat heavy food.

The ostrich is the largest and strongest of all known living birds. It is from six and a half to eight feet in height. Its feet and neck resemble those of the camel, and it can carry a man on its back without inconvenience. The Arabs call it the camel-bird. In captivity it is tame and gentle to those who feed it, and to whom

it has been accustomed, but savage and fierce towards strangers, whom it will endeavour to knock down and trample under foot.

The ostrich attracted the attention of mankind even in the earliest periods of their history. Hence it is frequently mentioned in the Old Testament : see above, p. 143. The most remarkable passage is Job xxxix. 13-18 : "Gavest thou the goodly wings unto the peacocks?* or wings and feathers unto the ostrich? which leaveth her eggs in the earth, and warmeth them in dust, and forgetteth that the foot may crush them, or that the wild beast may break them. She is hardened against her young ones, as though they were not hers : her labour is in vain without fear ; because God hath deprived her of wisdom, neither hath He imparted to her understanding. What time she lifteth up herself on high, she scorneth the horse and his rider." In reference to this passage, it may be remarked, that it alludes not only to the beauty of the plumage and the swiftness of the bird on foot, but especially to the period of incubation. The ostriches sit on their eggs when they inhabit temperate climates, but leave the incubation to the heat of the sun when they live in the torrid zone. The censure, therefore, contained in these verses is only applicable to the tropical ostrich, as, in cooler latitudes, both male and female are most assiduous in protecting the eggs with the natural warmth of their bodies. The male ostrich has usually from five to six female companions at the time of breeding, who relieve each other in the task of incubation during the day, the male taking their place at night, so as to be able, by his superior strength, to protect the eggs against the attacks of the jackal, tiger-cat, and other prowling animals, some of which are not unfrequently found dead in the neighbourhood of the nest, destroyed by a single stroke of his powerful foot.

The nest of the ostrich is merely a shallow cavity scraped within

* The word "peacocks" is really out of place in this verse, which is thus rendered in the *Speaker's Commentary* : "The pinion of the ostrich exulteth ; but hath she the fond wing and plumage of the stork ?"

the ground, of such dimensions as to be conveniently covered by one of these gigantic birds. The eggs are placed in a circular position, with the broad end uppermost. Each female lays from twelve to sixteen of them, so that there are sometimes sixty eggs in the same nest; but a smaller number is more common. The period of incubation is from thirty-six to forty days. Each egg weighs about three pounds, and is equal to about two dozen eggs of an ordinary barn-door fowl. It is very remarkable that some of these eggs are broken by the ostrich, and their contents given as food to the young birds already hatched, and usually by the time they are all eaten the young ostriches are able to go abroad with their mother and provide for themselves, eating such things as the desert affords. All are not, however, so fortunate. Sometimes, if the nest is disturbed during the absence of the bird, or the foot steps of man are discovered near it, it is forsaken, and then the young ostriches are found, either in the nest or in its neighbourhood, no bigger than well-grown pullets, half-starved, straggling and moaning about like so many distressed orphans who have lost their mother. In such a case as this, the ostrich may be said to be "hardened against her young ones, as though they were not hers, her labour" (in hatching her brood) "being in vain, without fear" of the evil consequences resulting from their abandonment. "The daughter of my people," says the prophet, "is cruel like the ostriches in the wilderness." (Lam. iv. 3.)

ORDER III.—INSESSORES, OR PERCHING BIRDS.

This constitutes the most numerous and varied order of birds having feet especially adapted for perching, and corresponds with the *Passerine* birds of some authors. These birds, when on the ground, rarely walk, but generally move by hopping with both feet simultaneously. Three of the toes of the feet are directed forwards, and one backwards; the legs and feet themselves are slender, and the claws, though curved, never constitute powerful hooked talons, as in the *predaceous* birds. Naturalists have classified these

birds, according to the form of their bill, into the following sub-orders :—

1. Conirostres, or conical-billed.
2. Dentirostres, or tooth-billed.
3. Tenuirostres, or slender-billed.
4. Fissirostres, or gaping-billed.

The Insectorial or Passerine birds of the Bible may, however, all be comprised under three only of these sub-orders, viz. :—

1. *The Conirostres*, or conical-billed birds, in which the bill is principally employed in crushing hard seeds, as, for example, the common house sparrow (*Passer domesticus*), belongs to the family of the Fringillidæ, or finches, for the most part small hardy birds, remaining with us through winter, and tenantry our fields, groves, hedgerows, and woodlands. Some of the family, as the linnet and the lark, are remarkable for their powers of song, and all associate in flocks when in search of food.

The common house sparrow inhabits Palestine, where it haunts the habitations of men with the same dauntless confidence which it displays in England, filling the air with its noisy twitterings. Reference was made to this bird by our Lord, Matt. x. 29 : "Are not two sparrows sold for a farthing? and one of them shall not fall on the ground without your Father. But the very hairs of your head are all numbered. Fear ye not therefore, ye are of more value than many sparrows." See also Luke xii. 6, 7. The sociable nature of the sparrow, and its habit of frequenting the haunts of men, is referred to also in Psalm lxxxiv. 3 : "Yea, the sparrow hath found an house, and the swallow a nest for herself, where she may lay her young, even Thine altars, O Lord of hosts, my King and my God."

Several species of sparrow inhabit Palestine, as the marsh sparrow, which is abundant on the banks of the Jordan. In Psalm cii. 7, "I watch, and am as a sparrow alone upon the housetop," reference seems to be made to one different from the lively gregarious species which usually assemble there. Tristram, our best authority, suggests that the blue thrush is meant.

The word translated sparrow in the above passages occurs forty times in the Old Testament, with the renderings *bird* and *fowl*; viz., Gen. vii. 14, xv. 10; Lev. xiv., thirteen times; Deut. iv. 17, xiv. 11, xxii. 6; Neh. v. 18; Job xli. 5; Psalm viii. 8, xi. 1, civ. 17, cxxiv. 7, cxlviii. 10; Prov. vi. 5, vii. 23, xxvi. 2, xxvii. 8; Eccles. ix. 12, xii. 4; Isa. xxxi. 5; Lam. iii. 52; Ezek. xvii. 23, xxxix. 4, 17; Hosea xi. 11; Amos iii. 5. It will be seen that in some of these passages the word is used very inclusively, denoting *birds* in general. It probably is very inclusive, comprehending a large number of passerine birds, larks, chats, thrushes, etc., etc.

THE RAVEN (*Corvus corax*).

This bird belongs to the crow family, and is therefore closely related to the rook, jackdaw, and magpie. It is not only the largest and most powerful, but the most sagacious and courageous member of this household of birds. Carrion constitutes the staple food of the raven, which, when not domesticated, naturally shuns the proximity of man, making its nest in tall trees, or, like the eagle, on the inaccessible ledges of rocks.

The raven is a very common bird in Palestine, and is frequently spoken of in the Bible. It is, in fact, the first bird mentioned in the Scriptures: (Gen. viii. 6, 7,) "And it came to pass at the end of forty days, that Noah opened the window of the ark which he had made: and he sent forth a raven, which went forth to and fro, until the waters were dried up from off the earth," but, being a carrion bird, appears to have found food, probably on the floating body of some animal which had been drowned. It therefore appears to have made the ark simply a resting-place; for, being a land bird, it was incapable of resting on the waves, like the sea-gulls, which fly all over the Atlantic, and which are often seen to do so, as most travellers who have crossed that ocean have noticed. The dove, on the contrary, being a vegetable feeder, came back to the ark hungry, and appears to have sought an entrance into the same, and hence Noah (verse 9) "put forth his hand, and took her, and pulled her in unto him into the ark."

Thus beautifully is the truth of the sacred narrative confirmed by the natural history of both birds.

The raven, being a carrion bird, is forbidden as food in Lev. xi. 15, and Deut. xiv. 14. It is mentioned in connection with the prophet Elijah, who was fed by ravens whilst living in the neighbourhood of the brook Cherith, one of the tributaries of the Jordan (1 Kings xvii. 2-6). Then there are those very encouraging passages in Job xxxviii. 41, and Psalm cxlvii. 9, which speak of God's care in providing food for ravens, which He does from His inexhaustible stores; and the moral lesson which our Lord Himself deduced from them—who so often quoted from the Old Testament in teaching the people and His disciples—not to be of doubtful mind as to the bread that perisheth: (Luke xii. 24,) “Consider the ravens: for they neither sow nor reap; which neither have storehouse nor barn; and God feedeth them: how much more are ye better than the fowls?” The plumage of these birds, though dark in hue, is lustrous in its aspect, even in temperate climates, and in warmer latitudes is still more brilliant. To this beautiful blackness there is reference in Solomon's Song v. 11: “His head is as the most fine gold; his locks are bushy and black as a raven.” The carnivorous habits of the raven are noticed in Prov. xxx. 17, where children who despise their parents, it is stated, will find a grave in the raven and other carrion birds which will feed upon them; and the solitary places in which the raven usually builds its nest are alluded to in Isaiah xxxiv. 11: “The owl also and the raven shall dwell in it.”

As to the intelligence and kindliness of the raven, the Bishop of Norwich, in his “History of Birds,” tells a good story. “A tame raven named Ralph and a dog were brought up together. The affection between them was mutual, as was well known in the neighbourhood. Ralph's friend, the dog, having broken his leg, the sagacious bird waited on him constantly with provisions, remaining almost continually near him until he was better.” This bird was said to be always kind to dogs when in any way maimed or wounded. It is a very curious fact that crows generally appear to

have a propensity to peck at the tails of dogs, and will lie concealed for that purpose, in order to pinch the tail of the unconscious animal, and disturb his equanimity. This appears to be done for amusement.

The word raven, as used in Scripture, no doubt includes several species besides the raven proper.



The Raven.

Family 2. *Dentirostres* (Lat. *dens*, a tooth, and *rostrum*, a beak), or toothed-billed birds, which are characterized by a notch or tooth near the extremity of their upper mandible, and also by its less or greater extent of curvature, approaching as in the case of shrikes, or butcher-birds, *Laniidæ* (Lat. *lanius*, a butcher); to that of birds of prey. This family of birds feeds chiefly on insects and worms, and contains some of our best songsters, as the nightingale, robin, blackbird, and thrush. The butcher-bird certainly is not only insectivorous, but it approaches to a bird of prey in its habits. "It feeds," says Mr. Yarrell, "upon mice,

shrews, small birds, frogs, lizards, and large insects. After having killed its prey, it fixes the body on a forked branch, or upon a sharp thorn, the more readily to tear off small pieces from it. It is from this habit of killing and hanging up their meat, that they have been generally called butcher-birds.

THE SONG-THRUSH, MAVIS, or THROSTLE, *Turdus musicus* (Lat. *turdus*, a thrush), universally considered as one of our finest singing birds, and is very generally distributed in all places not quite devoid of wood. This bird commences its song in early spring, and continues it to the beginning of autumn. Its food consists of insects, berries, and snails, and of the latter, which are injurious in the garden, he devours an immense quantity, breaking their shells against the stones in order to get at them. He may therefore be allowed a little fruit for his services; and if he suffered less from the gun for such pilfering, we should get better fruit crops. The female builds her nest generally in bushes; it is composed of dried grass and green moss, intermixed with earth, clay, and rotten wood. She lays four or five eggs of a pale blue colour, marked with dusky spots on the larger end.

Family 3. *Tenuirostres* (Lat., *tenuis*, slender, and *rostrum*, a beak), or slender-billed birds, almost exclusively confined to warm climates, feeding upon insects, larvæ, and the juice of flowers. To this family belong the beautiful humming birds, the smallest and most gorgeous of all the feathered creation; the superb menura, or lyre bird of Australia; and

THE HOOPOE (*Upupa epops*), which is the bird really denoted by the word which our translators have rendered lapwing in Lev. xi. 19, "And the stork, the heron, after her kind, the lapwing, and the bat;" the words being repeated again in Deut. xiv. 18. It is there forbidden as food, and declared to be an unclean bird. Despite its beauty, the hoopoe has a very disagreeable odour, arising from a substance secreted by the tail glands, so that its prohibition as food is nothing surprising, but only to be expected. It has a very elegant crest of ornamental feathers on its head, and is about the size of the missel-thrush, or twelve inches in length.

Some still adhere to the translation lapwing; but almost all writers agree in the rendering hoopoe.

Family 4. The *Fissirostres* (Lat. *fissus*, cleft, and *rostrum*, a beak), or cleft-beaked birds, having the gape-line extending far back, usually reaching under the eyes, and feeding on insects

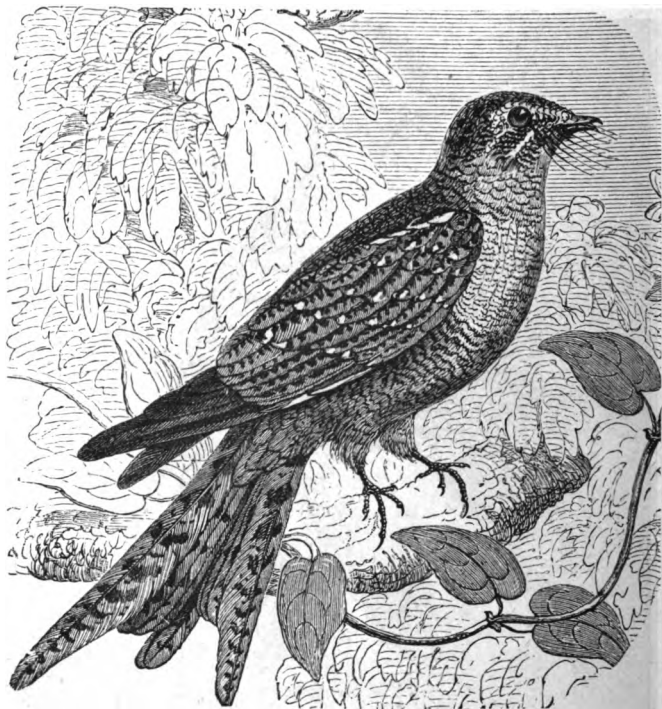


The Hoopoe.

which they capture on the wing, the margin of the mouth being often fringed with bristles for that purpose. This sub-order includes

THE NIGHT HAWK (*Caprimulgus Europæus*), or Goatsucker (Lat. *capra*, a goat, and *mulgeo*, to milk). This bird is found in all

parts of the world, and is common in Palestine. Its popular name, night-jar, is derived from its peculiar cry, which resembles the sound of a rapidly revolving spindle or wheel. It feeds on the wing, chasing and capturing the various moths, beetles, and other insects which fly abroad at the evening hour. Its long trilling note is usually heard from the trees. Suddenly it ceases, and the bird



The Goatsucker.

may be seen silently flying through the air in pursuit of its insect prey. It is between ten and twelve inches in length, and the spread of its wings is twenty inches. Its feet are very short, so that it appears to lie all its length on the branch of the tree on which

it is resting, and on the ground, where it usually makes its nest, it may be trodden under foot without being perceived, which it generally avoids by rising at the last moment.

The foot of this bird is very curiously constructed. The posterior toe, as in the owl, can be brought forward, and the middle interior one terminates in a pectinated claw (Lat. *pecten*, a comb),



Foot of the Goatsucker.

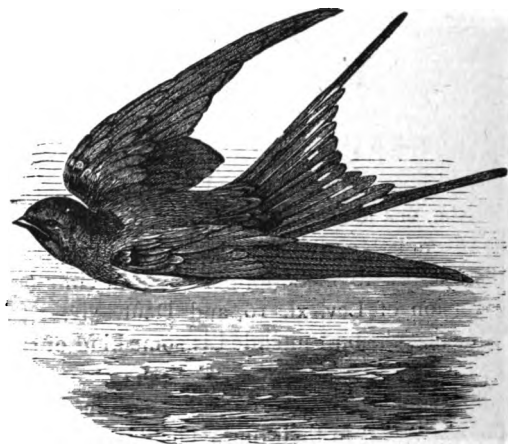
the use of which is not clearly ascertained. Some naturalists think that the bird cleans its plumage, and also the fragments of food from its vibrissæ, or the bristles of its gape, with this instrument.

It is, however, not certain that the night hawk is really one of the birds referred to in Scripture. We find the name in the authorised version of Lev. xi. 16, and Deut. xiv. 15; but it is most probable that the bird intended is some kind of owl, perhaps the barn owl.

The swallow family (*Hirundinidæ*) differs from that of the goatsuckers (*Caprimulgidæ*) in their diurnal habits, swifter flight, closer plumage, forked tail, and in the narrower gape of their bill, and the want of bristles on its margin. "The swallow," says Sir Humphrey Davy, in his *Salmonia*, "is the glad prophet of the year, the har-binger of the best season: he lives a life of enjoyment amongst the loveliest forms of nature. Winter is unknown to him; and he leaves the green meadows of England in autumn for the myrtle and orange groves of Italy, and for the palms of Africa." The amount of activity displayed by these birds is wonderful. They will spend the whole day flying about in search of insects, and they have this remarkable peculiarity in their flight, a facility of turning on the wing, which adds greatly to its grace and beauty; "for they can

double back, not merely at an angle, but at a very acute angle,—almost in fact returning on their previous course ; and this without the least appearance of effort.”* Their flight is the most elevated in fine weather, for then their insect prey rise highest on the wing ; they fly much lower in moist rainy weather, sometimes indeed so low as even to touch the water, over the surface of which they skim.

Three species are well known in this country, and as all are found in the Holy Land, we shall briefly describe them.

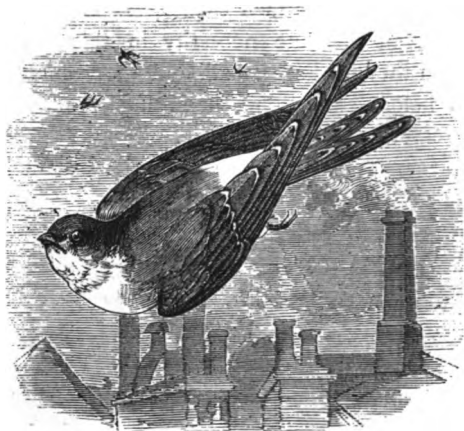


The Chimney Swallow.

The common CHIMNEY SWALLOW (*Hirundo rustica*), so-called because it generally builds its nest in the interior of chimneys, a few feet from the top, but is not particular as to this station, as it will build in the interior of any somewhat unfrequented building to which it can gain access, furnishing a good shelter for its little earthen edifice, formed of dirt and loam, tempered and wrought together with bits of straw and grass to render it tough and tenacious, the whole forming an open cup, the bottom of which is lined with feathers. Eggs, four to six, white, spotted with ash colour.

* “Zoology,” by W. B. Carpenter, M.D., F.R.S. In two volumes, 1845.

THE HOUSE MARTIN (*Hirunda urbica*) is rather smaller and much more familiar. It always builds on the outside of the house, usually under the eaves of the roof, or in the upper angles of the windows. Sometimes they build beneath the arch of bridges, a place affording excellent shelter and convenient access to the water, where their insect prey is most abundant. The nest is made of the same material, and is of a hemispherical form, with a small aperture at the top. They build in the morning only, beginning very early, and devote the rest of the day to food and



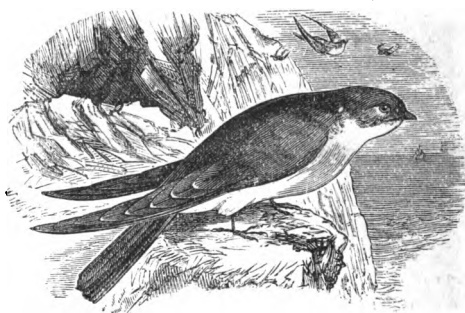
The House Martin.

amusement, so as to give the material time to harden. About half an inch layer is formed each time, and the nest is built in ten or twelve days. Interior lining, hay and feathers. Same number of eggs, but white.

THE SAND MARTIN (*Hirundo riparia*), our smallest swallow, excavates the most admirable cylindrical galleries in sandbanks, in situations usually inaccessible. The nest is at the end of the gallery, and consists of a small bed of hay and feathers.

To complete our list of British representatives of Palestine birds, members of the swallow family, it is necessary to add

THE SWIFT (*Cypselus apus*). These birds differ from the swallows in the structure of their feet, all the four claws pointing forward, instead of three forward and one backward ; also in the velocity of their flight, which is even greater than that of the swallows ; and lastly, in their breeding places, which are always holes in lofty buildings, such as church steeples and towers, or crevices in the heights of inaccessible rocks. The structure of their feet is most admirably adapted to enable them to effect an entrance into such places, forming excellent clinging organs, by means of which they can attach themselves securely to perpendicular surfaces, an absolute necessity in this instance. The insects on which they feed are small, and they generally collect a great number before swallowing them, their mouth being lined with a viscid secretion for that purpose.



The Sand Martin.

It would seem from the Bible that the habits of the swallow in Palestine and England are much the same. (Psalm lxxiv. 3,) "Yea, the sparrow hath found an house, and the swallow a nest for herself, where she may lay her young, even Thine altars, O Lord of hosts, my King and my God." Of course, the bird alluded to could not have been the sand martin, but must have been one of the species frequenting the habitations of man, most probably the swift. The swiftness of the swallow's flight is referred to in Prov. xxvi. 2 :

“As the bird by wandering, as the swallow by flying, so the curse causeless shall not come.” The “curse causeless,” or the curse of which God does not approve, pronounced against God’s people by their enemies, as in the case of Balak, king of Moab, who said to Balaam the prophet of God (Numb. xxiii. 7), “Come, curse me Jacob, and come, defy Israel,” “shall not come,” but fly from



them with the velocity of the swallow’s wing. The twittering of the swallow is alluded to in Isa. xxxviii. 14, “Like a crane or a swallow, so did I chatter;” and its migratory habits in Jer. viii. 7, “The turtle, and the crane, and the swallow observe the time of their coming.”

Our picture represents a gathering of these birds before leaving us for winter. They usually congregate in this manner for a day or two to arrange their plans, mode of flight, and other matters connected with their long journey! Why not? At all events, it is very certain they make noise enough for a debate on such topics! The best naturalists are silent, and will admit that their best answer to such a query is (Psalm cxxxix.) "Such knowledge is too wonderful for me; it is high, I cannot attain unto it."

There are two Hebrew words rendered *swallow*. (1) That which occurs in Psalm lxxiv. 3, Prov. xxvi. 2, really denotes this bird, but must not be strictly limited to this one bird; it probably includes other birds of rapid flight. (2) That found in Isa. xxxviii. 14, Jer. viii. 7, both times in conjunction with crane, denotes *crane*, whilst that rendered *crane* in these two verses really means swallow or swift. Hence, no change is made in the meaning of the verses; but for crane and swallow, we should read swallow and crane.

ORDER IV.—SCANSORES, OR CLIMBING BIRDS.

These birds have the four toes arranged in pairs, two before and two behind; a conformation of foot which renders walking difficult, whilst it gives them great power of clinging to the bark of trees, upon which they pass most of their time, and of climbing up their stems. The order embraces the families of the parrots, toucans, woodpeckers, and cuckoos.

THE CUCKOO (*Cuculus canorus*). We find this bird mentioned in our Bibles in Lev. xi. 16, Deut. xiv. 15; the Jews being ordered to hold it in abomination. In reality however the original word has no such meaning, but denotes either sea-gull or sea-mew, or possibly one of the petrels. As however the cuckoo is found in Bible lands, a few words respecting it may not be out of place.

Several species inhabit Palestine, one of them the cuckoo that visits this country. It arrives in England generally in the month of April, and its peculiar sound may be heard from May to July,

when it departs for warmer regions. In common with all the other members of the order, it is an insectivorous bird, and appears to prefer especially those common hairy caterpillars, the larvæ of the tiger-moth (*Arctic cija*), with the hairs of which its stomach is often completely lined.

Its singular habit of laying its eggs in the nest of other birds is well known, and we may add to this another remarkable fact, that although so large a bird, measuring more than a foot in length, its egg is not larger than that of the little birds amongst which it is deposited so as to aid, as it were in that deception which ensures its being hatched. When hatched, the old birds pay as much attention to the young cuckoo as to their own legitimate offspring; which is repaid



The Cuckoo.

with something that looks very much like ingratitude; for as soon as the intruder has acquired sufficient strength, he turns all the other birds out of the nest, and thus secures to himself the whole of the supplies brought to it by the parent birds. It is even said that the cry of this bird will induce any of the small birds in the neighbourhood to bring it food.

ORDER V.—RASORES, OR SCRAPING BIRDS.

The birds of this order are destined to pass their lives upon the ground, rather than among trees or upon the wing. Their food consists of grain and seeds, and they are furnished with short, blunt, robust nails, for scratching the surface of the ground and exposing them to view. The wings of these birds are short, and their powers of flight are therefore very inconsiderable; their

bodies are bulky and their legs robust. Instead of associating in pairs, the male has usually several females. The bill is short and arched. The back of the foot is furnished in the males with one or two spurs, which constitute formidable weapons of combat during the breeding season. The nest is always placed on the



Barn-door Fowls.

ground, very little art being shown in its construction, in which the male takes no part. The female only incubates.

These birds are the most useful to man of all the feathered tribes, affording him an abundant supply of nutritious and delicate food. This order includes—

The common barn-door fowl (*Gallus domesticus*), from time im-

memorial under the protection of man. The earliest historical records that we possess, the curious paintings of the Egyptians, show that this animal was as completely domesticated at that early period as it is now. It is not distinctly mentioned in the Old Testament, and was probably unknown to the Jews in the earlier period of their history. In the time of our Lord, however, the domestic fowl appears to have been largely bred in Palestine. Hence we have cock-crowing referred to as a measure of time (Mark xiii. 35), and by our Lord Himself, when he predicted to Peter, notwithstanding his earnest protestations of fidelity, his future denial of His discipleship (John xiii. 38). It is hardly necessary to add, that now, as in the days of our Lord, these birds crow in Palestine and in our own country, at certain hours, with almost mechanical regularity.

The word cock is only mentioned in reference to Peter's denial of our Saviour, and to cock-crowing as an indication of time. 'Hen' and 'brood,' or 'chickens,' occur in our Lord's touching words respecting Jerusalem (Matt. xxiii. 37, Luke xiii. 34).

The word *fowl* in Neh. v. 18 may denote poultry. 'Fatted fowl' (1 Kings iv. 23) may have the same meaning (Solomon may have introduced poultry from India); others suppose the meaning to be *fatted geese*.

Two of the Hebrew words often rendered *fowl* have already been noticed in speaking of birds of prey and of sparrows. The remaining word, which is of frequent occurrence, denotes birds in general.

The Peacock (*Pavo cristatus*) is of Eastern origin, although long naturalised in Europe, as it is found in the greatest profusion indigenous in the neighbourhood of the Ganges, and in the plains of the kingdom of Siam. As early as the days of Solomon they were imported into Judea, by the fleets which that monarch equipped on the Red Sea. The word occurs three times in our Bibles.

In 1 Kings x. 22, and 2 Chron. ix. 21, the meaning of the original word is undoubtedly *peacock*; but in Job xxxix. 13, the true rendering is *ostriches*. (See above, page 146.)

When pleased or delighted, and in the sight of his females, the peacock erects and displays his superb and magnificent fan of tail feathers ; all his movements are full of dignity ; his pace is slow and solemn ; and he frequently turns gracefully to catch the sun-



The Peacock.

beams and display the full grandeur and richness of his plumage. His feathers are, however, shed every year ; and then, conscious of his loss, he conceals himself till the return of spring gives him his feathers again.

THE PARTRIDGE (*Perdix cinerea*). These birds, of which two species are found in the United Kingdom, possess peculiar attractions to sportsmen. During the autumn and winter they keep together in small flocks called coveys, living on grain, seed, tender herbage, and insects; in spring they separate and pair, nestle on the ground,



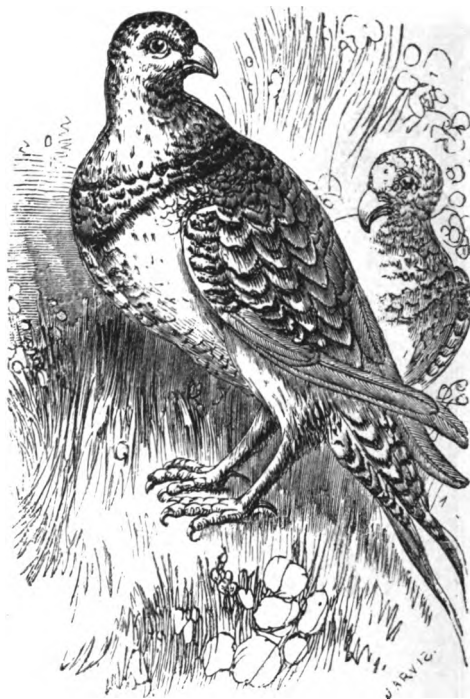
The Partridge.

and bear a numerous progeny. They run with great speed, and their flight, caused by regular and rapid beats of the wing, produces a whirring sound. In avoiding danger, however, they generally prefer skulking. The *Perdix cinerea* is not found in Palestine, being replaced by *Caccabis saxatilis* and *Ammoperdix Heyti*.

The first passage in which the partridge is mentioned in the Bible occurs in 1 Sam. xxvi. 20: "For the king of Israel is

come out to seek a flea, as when one doth hunt a partridge in the mountains."

Several species of these birds inhabit Palestine, one being restricted to the desert, which nestles in the clefts of the rocks, and runs swiftly there for protection when hunted. To this bird



The Quail.

David seems to have alluded when he urged his complaint to Saul, whose life he had spared when he might have taken it; for Saul had pursued him, and forced him to escape from the city to the rocky valleys, where, under the circumstances, he certainly was justified in comparing himself to one of the partridges which

frequented those places. Jer. xvii. 11 : "As the partridge sitteth on eggs, and hatcheth them not, so he that getteth riches, and not by right, shall leave them in the midst of his days, and at his end shall be a fool." Here reference is clearly made to the extraordinary number of eggs laid by these birds, sometimes more than twenty being found in the same nest, and to the gathering and consumption of them for food, so that many a poor partridge has been deprived of her expected brood.

THE QUAIL (*Perdix coturnix*). These birds are generally distributed over the eastern hemisphere, but they especially abound in the countries adjacent to the Red Sea. They resemble partridges to some extent in their appearance, and are migratory in their habits. They fly low, in vast flocks, and being weak-winged birds, always with the wind, waiting sometimes for days, until it blows in a direction favourable for their journey. Quails are mentioned in Exod. xvi. 13 : "And it came to pass that at even the quails came up and covered the camp ;" and in Numb. xi. 31, where it is stated that a wind brought them from the sea ; and the same event is spoken of in Ps. cv. 40 : "The people asked, and He brought quails, and satisfied them with the bread of heaven." Upwards of 3000 years have fled since these occurrences took place, yet the quail is as plentiful there now as in these early Scriptural times ; the same winds bringing them in flocks, and scattering them over the country.

ORDER VI.—COLUMBIDÆ, OR PIGEONS.

These birds differ somewhat from the Rasorial type, approaching that of the Insessores or Perchers, living in pairs, and more on the trees than the ground. They have the arched bill of the Rasores, but a more musical voice, greater powers of flight, build in trees or in the holes of rocks, and both parents sit upon the eggs.

All the species of doves and pigeons, either permanently residing in this country, or visiting it only temporarily, are found in the Holy Land. As for instance—



The Syrian Dove.

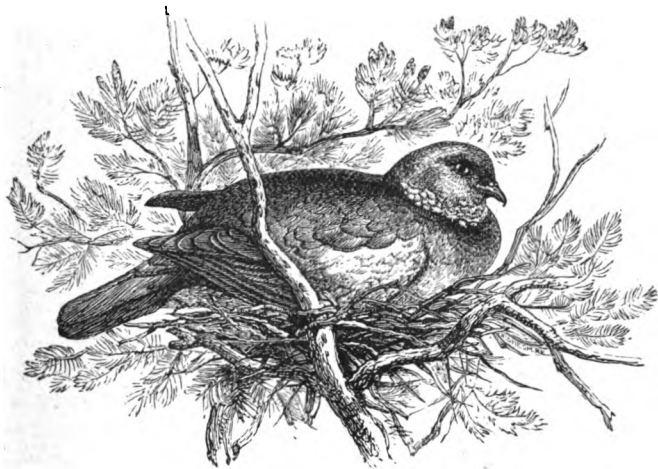
THE ROCK DOVE (*Columba livia*), supposed to be the original of most of our domestic varieties, or fancy pigeons as they are called ; as the Tumbler, so called from their curious habit of turning over suddenly in the air ; the Pouters, from their enormously inflated crop, which projects in front of the breast ; and the Fantails, which have the tail beautifully expanded into an arched form containing no less than thirty-six feathers, the normal number being twelve.

The rock dove lives and breeds abundantly in holes of rocks and caverns, and is common on all our rocky coasts. It does the same in Palestine, and is found also inland, the steep rocky sides of the valleys which run between the mountain ranges of the Holy Land, being literally crowded with these birds. Frequent allusion is therefore made to them in the Scriptures, as in the Song of Solomon ii. 14—"O my dove, that art in the clefts of the rock, in the secret places of the stairs, let me see thy countenance, let me hear thy voice ;" and again, Jer. xlviii. 28—"O ye that dwell in Moab, leave the cities, and dwell in the rock, and be like the dove, that maketh her nest in the sides of the hole's mouth." The ring dove, or cushat (*Columba palumbus*), which is generally distributed in all the wooded parts of England, and the stock dove (*Columba ænas*), found only in the Southern and Midland Counties, are also met with in Palestine.

The word used in these two passages occurs in all thirty-three times. It is rendered dove twenty-three times, and pigeon ten times. It probably includes all the doves or pigeons of Palestine, excepting the turtle-dove. In the New Testament we have dove in Matt. iii. 16, Mark i. 10, Luke iii. 22, and John i. 32, in reference to the descent of the Holy Spirit ; and dove in Matt. xxi. 12, Mark xi. 15, John ii. 14, 16, in reference to the sacrifices

once only (Luke ii. 24) is the word translated pigeon, and once besides (Matt. x. 16), "harmless," or rather simple, "as doves."

It is difficult to decide whether the dove's dung mentioned in 2 Kings vi. 25 is to be understood literally as such, or whether a kind of plant is intended, as the Star of Bethlehem (*Ornithogalum unbellatum*), an elegant little flower belonging to the natural order Liliaceæ, having a bulbous root, and used as an esculent vegetable in Syria. This plant is abundant in the plains and valleys about Samaria, and the dearth of its roots may be here mentioned as a token of famine beyond endurance.



Columba turtur.

THE TURTLE-DOVE (*Columba turtur*), found in the Southern Counties, is only a summer visitor to this country, and is common in Palestine. This bird is distinctly referred to in the Song of Solomon ii. 11, 12: "For lo, the winter is past, the rain is over and gone, the flowers appear on the earth; the time of the singing of birds is come, and the voice of the turtle is heard in our land;" and its migratory habits are alluded to by the prophet (Jer. viii. 7), "Yea, the stork in the heavens knoweth her appointed times, and

the turtle and the crane and the swallow observe the time of their coming ; but my people know not the judgment of the Lord."

Under the Levitical law, doves and pigeons were sacrificial birds (Lev. i. 14-17). These birds cost but little, and could easily be obtained from the dove-cote, generally an appendage to Jewish households, or from the myriad nests in the rocks of the ravines. Thus the means of sacrifice were placed within the reach of the poorest. There is an allusion to these Jewish dove-cotes in Isa. lx. 8, "Who are these that fly as a cloud and as the doves to their windows?"

The word turtle-dove occurs fourteen times in the Old Testament, and is rendered turtle-dove nine times and turtle five times. It is found only once in the New Testament (Luke ii. 24), in reference to the offering made by those who were too poor to bring a lamb (Lev. xii. 8).

ORDER VII.—GRALLATORES, OR WADING BIRDS.

THE STORK (*Ciconia alba*).

The stork belongs to the natural order Grallatores, or wading birds (Lat. *grallator*, a stalker), which have a very long bill and neck, and long slender legs to correspond, so that these birds can walk into the water on the margin of marshes to a certain depth without wetting their plumage, and procure therefrom their appropriate food—fish, frogs, lizards, molluscs, insects, and worms. The storks are all large birds, capable of living only in a warm climate. The best-known species is the white stork (*Ciconia alba*), represented in the picture, which is from three and a half feet to four feet in height, the body, neck, and breast being white, with the quills and coverts of the wing black, and the bill and feet red. These birds are migratory in their habits, visiting the central parts of Europe, especially Holland and Germany, in spring, and remaining there during the summer, departing, usually in the month of October, for their winter quarters in Asia and Africa.

The stork is seldom seen in this country, being only an occasional visitor to our shores ; it is, however, very common in Holland and Germany, where it approaches the dwellings of man without fear, and is treated as a welcome guest. It will build its nest in the



The Stork.

very centre of towns. In some places the people place large wooden boxes on the tops of their houses to induce the storks to build there, and the man whose house is selected for this purpose by a stork always considers himself particularly fortunate. Like

the vultures, they cleanse the streets of carrion and offal, and in many countries are considered sacred on account of the benefits which they confer. In the wood-cut you see two young storks in a nest, placed on the top of a platform or false chimney, which some Hollander built for the accommodation of these birds, perhaps generations ago. Some of the species do not migrate, but reside permanently in the warm countries where they are found, and are regarded with great favour by the inhabitants.

The nest of the migratory stork is formed of a mass of sticks and other coarse material. Three or four white eggs are laid, which are hatched in a month, and the young are then attended to with great care by both parents. The old birds manifest the greatest affection for their young, feeding them by putting their bills into the mouth and disgorging some of the half-digested food from their own stomachs. One always remains at home in the nest whilst the other goes abroad for food. A most remarkable instance of parental affection in a stork occurred during the conflagration of Delft, where a female stork, after continuing to make repeated but unavailing attempts to rescue her young from the flames, preferred herself to perish with them rather than desist from further effort and leave them to their fate.

After the young are hatched the greatest amount of tenderness and care is shown by the old birds in feeding them, in teaching them to feed themselves, and to fly. The young are taken to the marshes, and the frogs and lizards pointed out which are their proper food. When autumn comes, the storks congregate like swallows, and migrate to their winter's home in a warmer climate. In spring they return to the place where they built the year before, and regain their old nest, which, when once built, lasts them for years. It has been well ascertained that the same pairs usually arrive, and this, too, be it remembered, after an absence of several months and a migration of thousands of miles. And very seldom does it happen that any of them come until the bitter blasts of winter are over, and the gentle gales of spring are wafting everywhere health and a renewed vitality to both plants and animals;

so that not only do these birds congregate, determine on their leaders, the hour of their departure, and their order of flight, then rise together into the atmosphere and steer their course over land and sea through so long a voyage without a mistake, but they wait till the proper time is come. For well do they know when the ice and snow are gone in the north, and when the sun again shines forth there bright and warm ; when the fish and lizards are again active in fresh-water stream and marsh, and when the frogs begin to croak there ; in one word, these birds come well knowing that a table has been provided for them in that far-off country to which they are flying, and that they will be warm and comfortable there on their arrival. The reader can easily imagine a pair of storks glad enough to get back to their old homestead in the decayed tree or in the box provided for them, see them alighting there, and folding together their wearied wings after flying for thousands of miles through the air without food.

The instinct which brings these birds together, guides them in their flight, and scatters them on their arrival to their several homesteads and marshes, is indeed truly wonderful, and is referred to in the Scriptures. Jer. viii. 7 : "Yea, the stork in the heaven knoweth her appointed times, and the turtle, and the crane, and the swallow observe the time of their coming ; but my people know not the judgment of the Lord." It is evident that the prophet reproves the Jews as showing less sense than the stork, turtle, crane, and swallow, who knew the time when they should journey to their summer haunts in the north, whilst the Jews were blind to their own best interests, and neither knew nor considered the evil consequences which would assuredly result from their sinfulness and rebellion. That God gives these birds their unerring migratory instincts, and makes provision for them, is evident from the question in the book of Job, xxxix. 26, "Doth the hawk fly by thy wisdom, and stretch her wings to the south?" and Psalm civ. 17 : "As for the stork, the fir-trees are her house." And these, reader, are not the only passages in the Bible in which God's kindness in making suitable provision for birds is mentioned.

The word stork is also found in Lev. xi. 19; Deut. xiv. 18; Zech. v. 9; and in the margin of Job xxxix. 13.

THE BITTERN (*Botaurus stellaris*) is closely allied to the stork. It is found in this country, although becoming every year scarcer, as our waste and marshy lands which it frequents are reclaimed. It feeds at night, and during the day conceals itself amongst the



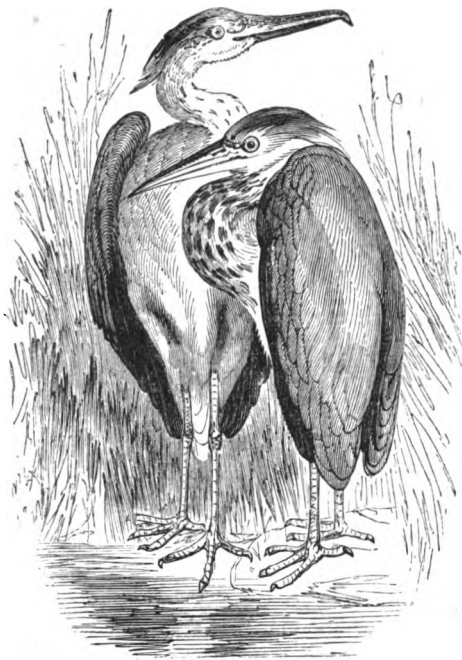
The Bittern.

rushes, sedges, and reeds which border the marsh-pools. This bird is remarkable for the booming or bellowing sound which it utters during the breeding season, which doubtless suggested its name, *Botaurus* (Lat. *bos*, an ox, and *taurus*, a bull). At other times its cry is very different. Living remote from human haunts on the marsh, bog, and quagmire, it continues to this day the emblem of desolation and solitude, as it was upwards of 2,500 years ago, when that awful denunciation was proclaimed against Babylon by the prophet Isaiah, xiv. 23: "I will also make it a

possession for the bittern, and pools of water; and I will sweep it with the besom of destruction, saith the Lord of hosts." See also Isaiah xxxiv. 11, Zeph. ii. 14.

THE HERON (*Ardea cinerea*), like the bittern, is a solitary bird, not however at the breeding season, for then they congregate together, and, approaching the habitations of man, usually build in trees! The beak of the heron differs from that of the bittern, being larger, more powerful, conoidal in form, and tapering to a point. The heron is also somewhat larger than the bittern. Like that bird, it frequents marshy pools of water, and is to be found where all is wild, uncultivated nature. The banks of rivers and lakes are,

however, a favourite habitat, and it may be seen standing in their shallow waters, watching motionless until a fish, its principal food, comes within reach, when it suddenly darts forth its neck, seizes it with its strong bill, and swallows it in a moment. Like the storks, herons are migratory in their habits; it is only, however, from very cold countries that the heron migrates. Some of the species are adorned with elegant plumes and crests. The heron is only men-



The Heron and Cormorant.

tioned twice in the Scriptures, Lev. xi. 19, and Deut. xiv. 18, where it is forbidden as food. It is doubtful, however, whether the word means the heron or the great plover.

Two other birds in this class require a brief description, the purple water-hen and the ibis. These names are not to be found

in our Bibles, but one or other of these birds is probably intended by the word rendered "swan" in Lev. xi. 18, Deut. xiv. 16.

THE PURPLE WATER-HEN (*Porphyrio antiquorum*) belongs to the family of Rallidæ, or rails, which includes also the gallinules, water-hens, etc., wading birds distinguished by their compressed form of body, long and slender toes, with a membranous margin, by means of which they are enabled to support themselves on the floating aquatic vegetation which covers the surface of the lakes, ponds, and marshes which they frequent. These birds seldom fly, owing to the shortness of their wings, but they run or swim very readily, although they delight chiefly in shallow water, which they can wade through. The nest is constructed of sedges and coarse grass near the water's edge, usually on a sort of raft, so as to accommodate it to the rising or the falling of the water. The eggs are of a light yellowish-brown colour, marked with rust-coloured spots; and it is said that the mother-bird, when she leaves her nest in search of food, scrapes leaves and rushes over them, not to keep them warm, but to conceal them from the prying eyes of magpies, jays, and other egg-devouring birds. The flesh of these birds is good, and as they live chiefly on aquatic seeds and vegetable aliment, they may be considered as aquatic Gallinacæ. The colour of this species of *Porphyrio* is a rich blue, which becomes on the back dark indigo, and on the head, neck, throat, and breast a beautiful turquoise hue. The bill, legs, and feet are pinky red. The bird is about eighteen inches in length.

THE SACRED IBIS (*Ibis religiosa* or *Numenius ibis*, Cuv., from Gr. *noumenia*, the new moon). This bird, which was worshipped by the ancient Egyptians in their temples, sculptured by them on their monuments, and embalmed by them after death, was long supposed to belong to some species of curlew (*Numenius arquatus*) now extinct, but the researches of Cuvier and our modern naturalists have proved it to be still living on the banks of the Nile, as in the days of the Pharaohs. Various reasons have been assigned for the religious veneration with which this bird was for-

merly regarded, some saying that the ibis destroyed the serpents so numerous in the country ; others that it was regarded with favour as one of the harbingers of the overflowing of the Nile, on which, as is well known, the fertility of the country depends, the bird migrating into Egypt about that time.

The legs of the sacred ibis are long and slender, and its bill is long, tapering to a point, and gently curved downwards like



The Sacred Ibis.

that of the curlew. These birds feed chiefly in groups of ten or a dozen, on the margins of lakes and rivers, principally on worms, mollusca, and frogs, arriving in Egypt as soon as the waters of the Nile begin to rise and overflow their banks, and remaining in the country until they have again subsided into their usual channels, and they are thus deprived of their daily supplies of food. Formerly this bird may have devoured snakes, and this idea is

strengthened by the fact that Cuvier found the scales and bones of snakes within the mummied corpse of an ibis found in an ancient Egyptian tomb, so that these reptiles may have been formerly abundant in Egypt; of this fact, however, we are assured by Cuvier, that the sacred ibis (*Numenius ibis*, Cuv.) is identical with the present species now living in Egypt, and which has not changed its habits for at least three thousand years, of picking up a living on the banks of the Nile, although the stomachs of these birds in modern times contain no remains of snakes, but chiefly those of mollusca and insects. The sacred ibis of ancient Egypt is now called in modern Egypt "Abou Hannes," *i.e.*, Father John, or "Abou Mennel," *i.e.*, Father Sickle Bill, the former name being used in Upper, and the latter in Lower Egypt. The plumage of the ibis is white, with the exception of the tips of the wings. The head, neck, and feet are black. Our engraving is a copy from Cuvier.

THE CRANE (*Grus cinerea*). These are large and handsome



The Numidian Crane.

birds, having the bill straight, strong, sharp-edged, and tapering to a point, with both mandibles of equal length. They breed in spring and summer, in the warmer parts of Europe and Asia, and winter in Africa and India. Their legs are long and slender, as they frequent marshy districts, and feed upon the fresh-water shell-fish, insects, and reptilia which are to be found there; but their diet is also vegetarian, and they subsist upon grain and the seeds of plants, visiting cultivated ground for that purpose. They are migratory birds, performing their aerial journeys at an im-

mense height, flying in the form of a wedge ➤, and uttering loud, clear cries, which may be distinctly heard even when their distance has become so great as to render them almost imperceptible. To these cries there is reference in Isa. xxxviii. 14, "Like a crane or a swallow, so did I chatter. I did mourn as a dove;" and to their migrations in Jer. viii. 7.

As is said above (see swallow), the words for swallow and crane in these two verses should change places.

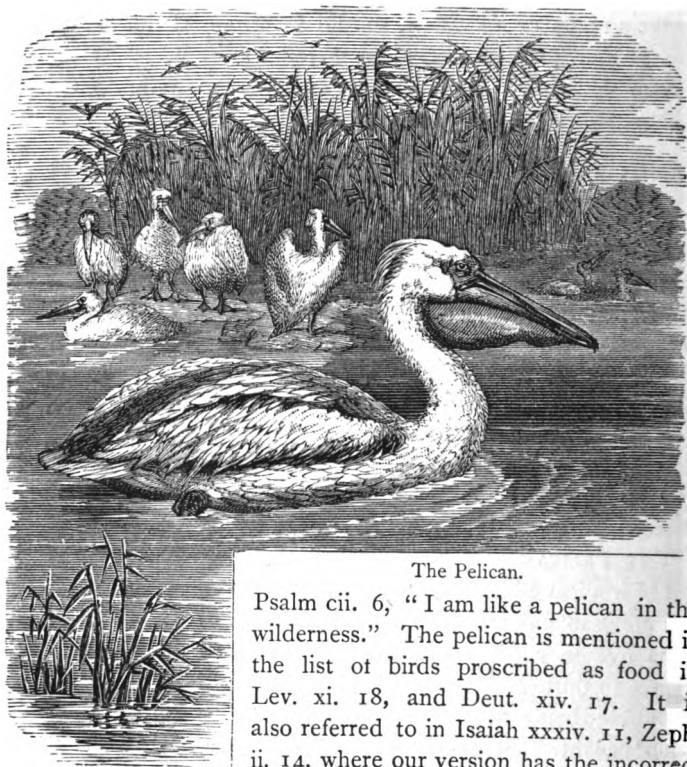
ORDER VIII.—NATATOIRES, OR SWIMMING BIRDS.

These birds have short legs, webbed feet, the toes being united by intervening membrane, and specially adapted for swimming, and the whole body protected by a dense covering of feathers, and a thick down next the skin. The plumage is oiled by the bird itself, the supply being obtained from a secretion contained in certain glands near the tail. The neck is long, so as to enable the bird to plunge its head far down in search of its food, which usually consists of fish, molluscs, and insects, and the roots of aquatic plants.

There are two birds belonging to this order mentioned in the Bible.

THE PELICAN (*Pelecanus onocrotalus*). This bird is an inhabitant of tropical climates, sociable, or living in flocks near the coast, but going inland for the sake of incubation. It is a large bird, from five to six feet in length, with an expanse of wing of from twelve to thirteen feet. It feeds on fish, the skin below the lower mandible being dilated into a pouch, where they are stored when caught. These birds both swim and fly well. They do the last when fishing, hovering above the water at a height of from twenty to forty feet above its surface, and darting down on the fish beneath them, which they invariably capture. When the store of fish in the pouch is sufficient, the pelican leaves the fishing ground for the most solitary places, where it will sit for hours, whilst the process of digestion is going on, perfectly motionless, looking more like a huge white stone

than a living, active bird. Under such circumstances, and considering its surroundings, it may be appropriately regarded as a type of solitude and desolation, and as such it is referred to in

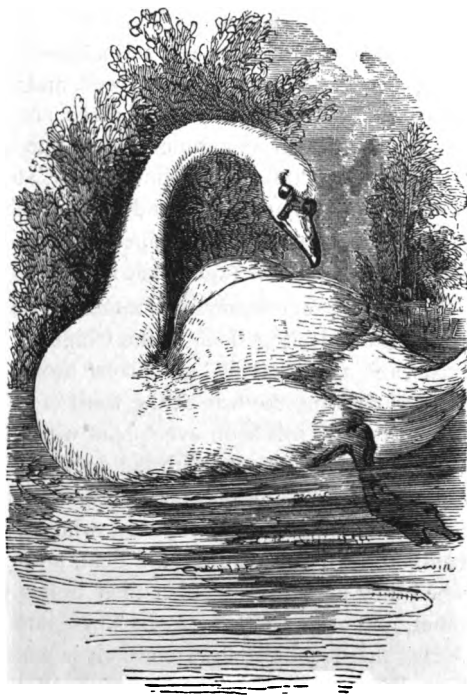


The Pelican.

Psalm cii. 6, "I am like a pelican in the wilderness." The pelican is mentioned in the list of birds proscribed as food in Lev. xi. 18, and Deut. xiv. 17. It is also referred to in Isaiah xxxiv. 11, Zeph. ii. 14, where our version has the incorrect rendering "cormorant."

THE SWAN (*Cygnus ferus*), in its wild state, is nearly five feet in length, above seven in the extent of its wings, and weighs about fifteen pounds. They are web-footed birds, distinguished by their superior size, muscular power, and graceful and majestic appearance. Their neck is long and slender, their legs short, their

plumage snowy white, and their bill black. The female makes her nest of reeds, rushes, and withered leaves in spring, and usually lays six or seven thick-shelled eggs, which both parents watch with the most unremitting care. The eggs are hatched in about six weeks, and the young are called cygnets. The tame swan is simply this wild species partly reclaimed from a state of nature, and as it is a gentle and inoffensive bird, invited by the friendly and protecting hand of man to ornament the surface of the artificial ponds and lakes in his pleasure grounds, on these the swan cannot be regarded as a captive, as he enjoys all the sweets of liberty.



The Swan.

The swan is mentioned in our Bibles, in Lev. xi. 18, and Deut. iv. 16. The Hebrew word, however, has probably a different meaning. It has been variously interpreted as purple water-hen, sacred ibis, pelican, and cormorant. The first or the second is probably correct. (See page 176.)

THE CORMORANT (*Phalacrocorax carbo*), or Bald Raven, is forbidden, along with the pelican, as unclean food, in Lev. xi. 17, Deut. xiv. 17. This bird is clearly related to the pelican. It is

about three feet in length, and of a blackish colour, tinged with green. The mandibles are straight, compressed, about the length of the head, the tip of the upper one being hooked to prevent the slippery prey from escaping; the lower mandible is not furnished with a pouch, but the throat is capable of considerable dilatation. These birds are generally distributed over the face of the globe. They feed on fishes, especially eels and mollusca, and are generally to be found near fresh water. They fly well, and make their nests in trees, on the ground, or in the holes of rocks, according to circumstances. When fishing, they sometimes rise to the surface with fish across their bills, and throw it up into the air, so as to make it fall head foremost into their open mandibles, which greatly facilitates the task of swallowing. The appetite of the cormorant seems all but insatiable. It is said to eat its own weight of fish in a day.

The Chinese cormorant (*Phalacrocorax sinensis*) is trained to catch fish and bring them to the Chinese. They are taken out in boats, and a ring having been placed around their necks to prevent their swallowing the fish, at the word of command they jump into the water, which is soon overspread with them, catch the fish, and bring them to the boats, with the docility of dogs. Sometimes they are more disposed for play than work, when they are notified of their neglect of duty by their owners, who strike the water with the bamboo used for guiding the boat, and call out in angry tones, when they immediately cease their frolics in the water with each other, and attend to business. These are not fed whilst at work during the day, but only when their labours are over, and they are brought ashore in the afternoon. Each cormorant then receives about half a pound of fish and some pulse jelly.

It should be said that, though the cormorant is probably the bird intended in the two passages quoted above, the question is not free from doubt. It is not impossible that the word really means gannet or tern. As to Isaiah xxxiv. 11, Zeph. ii. 14, where for *cormorant* we must read *pelican*, see above (page 180).

CHAPTER III.

CLASSES III. AND IV.—REPTILES AND FISHES.



THESE constitute the two remaining groups of vertebrated animals. The mammalia and birds have been called warm-blooded animals, because the circulation in them is distinctly double, and their respiration therefore complete. In these animals the heart (fig. 1) has two auricles (*ra*, *la*) and two ventricles (*rv*, *lv*), and there is no direct communication between its right and left sides, and therefore no intermixture of the dark, impoverished venous blood, which is returned to the right side of the heart from all parts of the body, with the

Fig. 1.



Fig. 2.

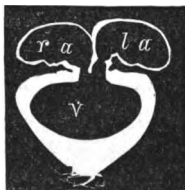


Fig. 3.



Fig. 1. Heart of mammalia and birds. *ra*, right auricle ; *rv*, right ventricle ; *la*, left auricle ; *lv*, left ventricle.

Fig. 2. Heart of reptiles. *ra*, right auricle ; *la*, left auricle ; *v*, ventricle.

Fig. 3. Heart of fishes. *v*, ventricle ; *a*, auricle.

bright red, enriched arterial blood which enters its left side from the lungs. The blood of the mammalia and birds being thus per-

fectly oxygenated, these animals retain their own fixed temperature throughout the year, despite the variability of that of the atmosphere.

But with reptiles and fishes it is otherwise ; for in reptiles (fig. 2) the heart has only two auricles and one ventricle, and in fishes (fig. 3) only one auricle and one ventricle, so that the venous and arterial blood become necessarily mixed together in the heart, and sent forth by its pulsations to all parts of the organisation of these animals in an imperfectly oxygenated condition. The temperature of reptiles and fishes, therefore, tends without ceasing to that of the medium in which they live, that is, to the temperature of the air and water by which they are surrounded. For this reason reptiles and fishes have been called cold-blooded animals. Whilst, therefore, as a general rule, mammals and birds, which retain their heat, continue in a state of activity throughout the year, reptiles and fishes, which gradually lose theirs with the declining temperature of the air and water, enter upon a state of inactivity and torpor, from which they do not awake until spring, when the weather again becomes mild and warm, and the temperature of both rises with that of their atmospheric and aqueous surroundings.

It is indeed undeniable that birds, in severely cold weather, sometimes suffer greatly from the cold, and even perish for want of food and warmth ; indeed, Matt. x. 29, "Are not two sparrows sold for a farthing? and one of them shall not fall to the ground without your Father," implies that God sometimes permits these things to happen. How great, therefore, must be His kindness to these humbler forms of life, the reptiles and fishes, whom He has "made a little lower" (Ps. viii. 5) than the mammals and birds, to send them to sleep in cold climates, and so preserve their lives, and render them, at the same time, unconscious of the severity of the weather. In England, during the winter months, the snakes, lizards, frogs, and toads are all so benumbed with the cold that they appear to be dead, and the fresh-water fish bury themselves in the mud of the rivers, ponds, and streamlets

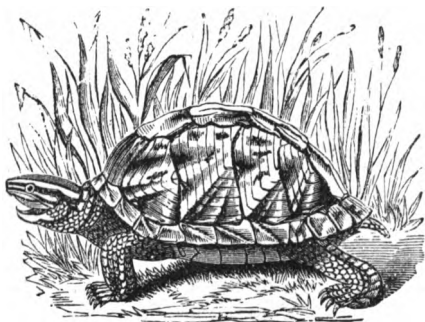
which they frequent. All, however, revive again, as soon as the warm rays of the spring sun reach them in their winter's home. It is true that a similar provision has been made for a few of the insect-eating mammalia, such as the bat and mole, which would perish in the absence of their insect food during winter, but the animals thus kindly favoured belong chiefly to the lower orders of reptiles and fishes. The dependence of all wild animals on the bounty of their Creator, their apparent and real death in winter, and the renewal of their life in spring, are beautifully and clearly described in Ps. civ. 27-30 : "These wait all upon Thee ; that Thou mayest give them their meat in due season. That thou givest them they gather : Thou openest Thine hand, they are filled with good : Thou hidest Thy face, they are troubled : Thou takest away their breath, they die, and return to their dust. Thou sendest forth Thy Spirit, they are created : and Thou renewest the face of the earth."

CLASS III.—REPTILIA, OR REPTILES.

This class has been divided by naturalists into the following orders :—

ORDER I.—THE CHELONIANS, OR TORTOISES.

These reptiles are characterised by the enclosure of the body



Tortoise.

between two bony shields called in science the *carapace* and *plas-*

tron. The upper shield, or carapace, has on its under surface the vertebræ and ribs, which in this animal are strangely altered; the first being rendered immovable, and the last widened into plates, which touch and unite with each other throughout their entire extent. The *plastron*, or under shield, shows also that it is only

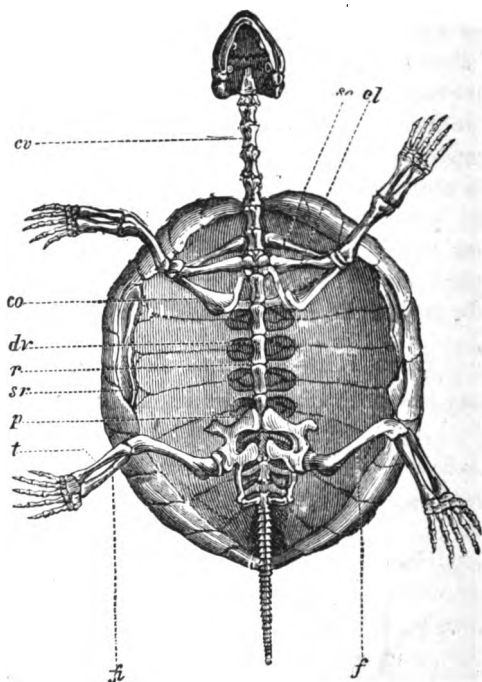


Fig. 4. Skeleton of Land Tortoise, from which the plastron, or under shield, has been removed. *cv*, cervical vertebræ; *dv*, dorsal vertebræ; *r*, ribs; *sr*, sternal ribs, or marginal pieces of the carapace; *sc*, scapula; *cl*, clavicle; *co*, coracoid bone; *p*, pelvis; *f*, femur; *t*, tibia; *ff*, fibula.

an expansion of the bones of the sternum or breastbone, of which it is a peculiar modification. The soft body of the tortoise is attached by muscles to the inner surface of these two enveloping shields which have on their margin suitable apertures, through

which the tortoise can protrude or withdraw within their enclosure, for protection, its head, tail, and four feet. The shell or covering of the tortoise is therefore not its hardened skin, but the skeleton of the animal itself enclosing the fleshy parts of the body, the reverse of its usual position in the mammalia and birds, where the bony skeleton is inside, and the flesh and skin outside, the animal.

When we see a tortoise slowly pacing along, its head and feet protruded from the unyielding armour in which its body is encased, the question naturally arises, "Why should such a reptile as this be classed among the vertebrate animals? Where are the vertebræ and the ribs?" This question is answered by an examination of the under surface of the carapace, or upper shield, which covers the back of the animal, which reveals them.

We derive from these reptiles two important articles of commerce, turtle soup and tortoiseshell; the former the greatest luxury of the table, the latter the most prized of horny materials.

In the marsh and river tortoises the toes are divided and webbed so as to increase the extent of surface, and in the marine tortoises or turtles they are extended into large paddles, by which these animals are enabled to propel themselves rapidly through the water.

The longevity of the turtle, and its capability of sustaining severe mutilations with impunity, are interesting points in its natural history which we can only mention, but have not space for their discussion.

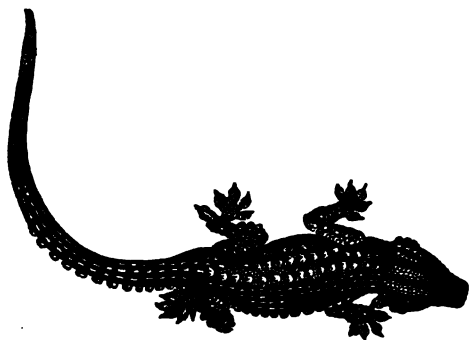
The common tortoise (*Testudo Græca*) is very plentiful in Palestine. The eggs of this reptile are to-day as much in demand as those of the common barn-door fowl, and are eaten by the inhabitants of Palestine. Hence we might have expected to find many references to it in the Bible. This, however, is not the case. The word occurs in one passage only, Lev. xi. 29: "These shall be unclean unto you, among the creeping things that creep upon the earth; the weasel, and the mouse, and the tortoise after his kind;" and even here there is no doubt that a different animal is really intended. The Hebrew word seems to denote a kind of

lizard, probably the *Uromastix spinipes*, or the Arabic *Dhabb*, which is very common in Arabia and Northern Africa.

We have already seen that the word rendered mole in Lev. xi. 30, probably denotes the chameleon. That rendered chameleon is a lizard of a different species, perhaps the *Psammosaurus scincus*, supposed by some to be the true skink of the ancients, common in the Egyptian deserts.

The word lizard occurs once only in the Old Testament, and there is only one other passage in which an animal belonging to the lizard class is named in our Bibles. In reality, however, there are seven words which probably denote lizards. Each of these words occurs once only. Six of the seven are found in Lev. xi. 29, 30; and in the authorised version are rendered *tortoise*, *ferret*, *chameleon*, *lizard*, *snail*, *mole*; the seventh is the word translated spider in Prov. xxx. 28: "The spider taketh hold with her hands, and is in kings' palaces." It is not easy to identify the species indicated by each word. The words rendered *ferret*, *lizard*, *spider*, probably signify various species of Geckotidæ.

THE WALL GECKO, *Platydactylus muralis* (Gr. *platys*, broad, and *dactulon*, a toe, and Lat. *muralis*, appertaining to a wall). This



The Wall Gecko.

lizard has a large and somewhat triangular head, the eyes large and prominent, but without eyelids, and the whole upper surface of

the body is covered with granular scales. The body is depressed in form, the legs short, and the feet palmated, or flattened and resembling the human hand. In consequence of this peculiarity of structure, they can ascend walls and run along ceilings. They lurk in crevices during the day, and come forth at night in pursuit of their insect food. This lizard inhabits all the countries bordering the Mediterranean. The geckos occur abundantly in warm climates. Their appearance is dark and repulsive, and they are generally considered poisonous, although timid and harmless.

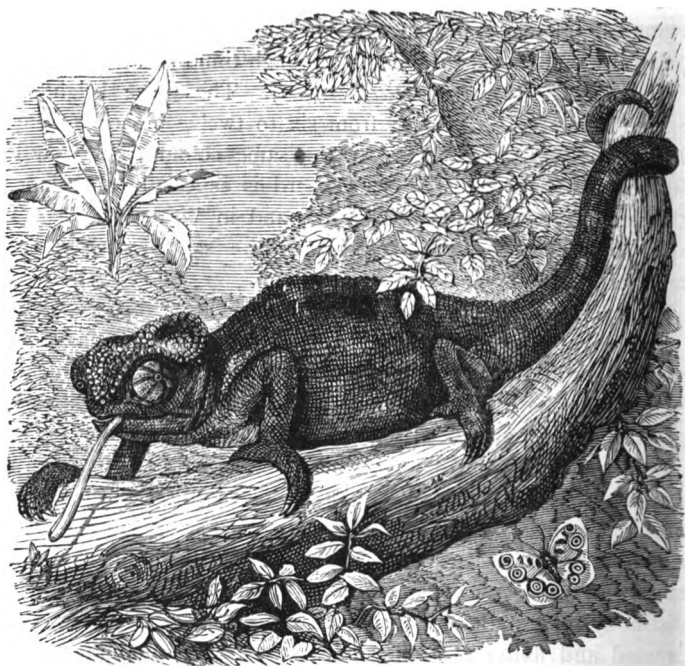
The SAND LIZARD (*Lacerta agilis*). These are bright-eyed, active little animals, varying from six to twelve inches in length, living on sandy heaths, and of the same colour as the sand in which they burrow. The sand lizard is especially abundant in this country, in Southern Europe, and in Western Asia. The snail of Leviticus xi. 30 is probably the sand lizard, and the mole of the same verse is the chameleon.

The genus Chameleon contains about eighteen known species. The present one (*Chamaleo Africanus*) is the common chameleon, and occurs in all the northern parts of Africa.

Perhaps there is no reptile to which a greater degree of popular interest attaches itself than to the chameleon, one of the members of the lizard family, which is confined exclusively to the warmer parts of the Old World, occurring in all the northern parts of Africa and also of India. All the eighteen species of chameleon which are known to naturalists agree in the following characters: Head somewhat pyramidal in shape, large, angular, and distinctly separated from the short, thick neck; body much compressed and flattened at the sides; the back surmounted with a sharp serrated ridge; tail round, tapering, and prehensile (Lat. *prehendo*, to lay hold of), about the same length as the body; legs four, the feet having five toes, two of which are smaller and opposable to the other three, and thus beautifully formed for the grasping of the branches of those trees among which these animals are usually found.

The mouth of the chameleon is very large, the teeth sharp,

small, and three-lobed, and the tongue, which is a hollow tube, with a swollen, knob-like extremity, and covered with a viscid secretion, is darted out with unerring aim—if necessary, to twice the length of the animal—at its insect prey, and then drawn back and into the mouth with lightning-like rapidity. The chameleon is, indeed, capable of enduring a prolonged fast, and this fact, together



The Chameleon.

with the difficulty of detecting the instantaneous and unerring movement of the tongue, by which the insect prey is captured, led the ancients to believe that the chameleon lived on air; but this is quite a mistake, for the chameleon is now known to be insectivorous.

These curious animals are arboreal in their habits, and traverse the stem and branches of trees, in a slow and cautious manner, by the aid of the grasping powers of their feet and tail, in search of food, darting out their tongues at such insects as come within their reach, with inconceivable rapidity ; so that an insect on a leaf, or a drop of water on a twig, if a hungry or thirsty chameleon happens to be near, is gone in a moment, to the surprise of the spectator, who, although carefully watching the animal, is unable to detect the slightest movement on its part. "I never knew," says an acute observer, "a chameleon, I long kept, miss his aim but once, and then the *fly was on the other side of the glass !*"

Chameleons are usually very inanimate in their appearance. They will remain for hours together in precisely the same position. Their lungs are large, and are connected, as in birds, with air-cells which lie among the muscles and beneath the skin ; hence the generally compressed appearance of the animal varies greatly ; for, according as these cavities are filled with air or the contrary, does the body of the chameleon present a full and bloated or it may be the next moment a lean and shrunken aspect.

All our readers have heard of the singular changes of colour for which the chameleon is so celebrated, and which have been described in a well-known piece of poetry with which every school-boy is familiar. Allowing for a little poetical exaggeration, there is much that is true in the poem on the chameleon—translated from the French of M. de la Motte, and versified by the Rev. James Merrick—as the animal under certain circumstances passes gradually from its natural pale grey colour, through the different shades of pale green, yellow, and dingy red, to brown, violet, and even black. Previous to its assuming a change of colour, it makes a long inspiration, the body swelling out to twice its usual size ; and as this inflation subsides, these changes of colour take place. Naturalists by no means agree in opinion as to the cause which produces them. The following are, however, some other curious facts in the natural history of this animal which are by no means so generally known.

Notwithstanding that the body of the chameleon is symmetrical as to its two halves, like that of every other vertebrated animal, yet there is every reason to believe that there are two distinct centres of nervous operation instead of one, and that the two symmetrical halves of the one body of the chameleon are to some extent independent of each other, and form two lateral centres of perception, sensation, and motion. There are many facts which are favourable to this opinion.

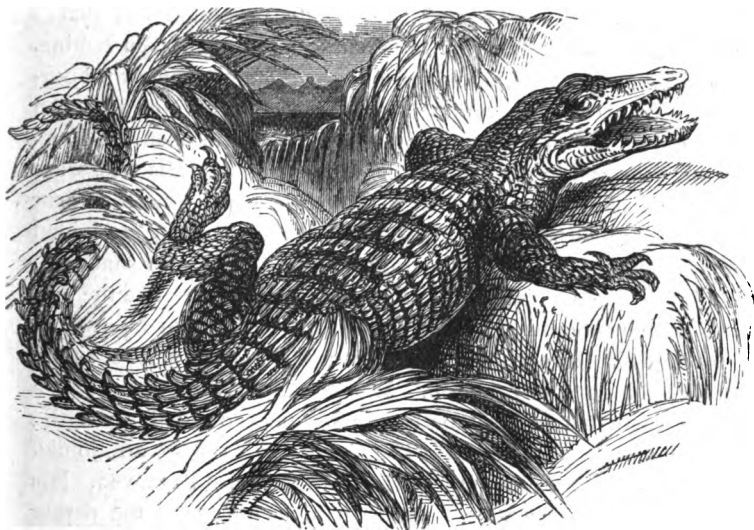
1. The eyes of the chameleon are capable of independent motion. Thus in every other vertebrated animal, whether beast, bird, reptile, or fish, the eyes move simultaneously to the right, left, up or down, that the gaze of both may be directed to one object; in fact, if we look at any object with one eye, we necessarily regard it with the other. These movements of the eyes are simultaneous, because the body is a unit, and possesses only one nervous centre of perception. But it is otherwise with the chameleon, which can look to the left with one eye and to the right with the other at the same moment, and therefore two different impressions must necessarily be conveyed to their respective centres of perception.

2. The chameleon may be asleep on one side and awake on the other. "When cautiously approaching my specimen at night," says Dr. Weissenborn, an eminent German naturalist, "with a candle, so as not to awaken the whole animal by the shaking of the room, the eye turned towards the flame would open, and begin to move, and the corresponding side to change colour; whereas the other side would remain for some seconds longer in its torpid and unchangeable state, with its eye shut." The chameleon may therefore be regarded as a double animal. Such appears to be the view taken by this distinguished naturalist. Again and again are we told in Scripture that the works of God are wonderful, and we see everywhere in nature the same teaching.

ORDER II.—SAURIANS, OR LIZARDS.

THE LEVIATHAN, OR CROCODILE (*Crocodilus vulgaris*).

The Leviathan is an animal unknown by that name to naturalists, whose description occupies the whole of the forty-first chapter of the Book of Job. The term Leviathan is Hebrew, and is now generally admitted to refer directly to the common crocodile of the river Nile, as the description in Job certainly best agrees with



The Leviathan, or Crocodile.

the strength, habits, and natural armour of that formidable and ferocious reptile. To make this clear, we give the authorised version of the chapter as it stands, introducing the corrections in their appropriate places: "Canst thou draw out leviathan with an hook? or his tongue with a cord which thou lettest down? Canst thou put an hook into his nose, or bore his jaw through with a thorn? Will he make many supplications unto

thee? will he speak soft words unto thee? Will he make a covenant with thee? wilt thou take him for a servant for ever? Wilt thou play with him as with a bird? or wilt thou bind him for thy maidens? Shall the companions make a banquet of him? shall they part him among the merchants? Canst thou fill his skin with barbed irons? or his head with fish spears? Lay thine hand upon him, remember the battle, do no more. Behold, the hope of him is in vain: shall not one be cast down even at the sight of him? None is so fierce that dare stir him up: who then is able to stand before me? Who hath prevented me, that I should repay him? Whatsoever is under the whole heaven is mine. I will not conceal his parts, nor his power, nor his comely proportion. Who can discover the face of his garment? or who can come to him, within his double bridle? Who can open the doors of his face? his teeth are terrible round about. His scales are his pride, shut up together as with a close seal. One is so near to another, that no air can come between them. They are joined one to another, they stick together, that they cannot be sundered. By his neesings a light doth shine, and his eyes are like the eyelids of the morning. Out of his mouth go burning lamps, and sparks of fire leap out. Out of his nostrils goeth smoke, as out of a seething pot or cauldron. His breath kindleth coals, and a flame goeth out of his mouth. In his neck dwelleth strength: before him leapeth terror. The flakes of his flesh are joined together: they are firm in themselves; they cannot be moved. His heart is as firm as a stone; yea, as hard as a piece of the nether millstone. The mighty tremble at his greatness: through terror they are confounded. The sword of him that layeth at him cannot hold: the spear, the dart, nor the breastplate. He esteemeth iron as straw, and brass as rotten wood. The arrow cannot make him flee, slingstones are turned with him into stubble. Darts are counted as stubble. He laugheth at the shaking of a spear. Sharp stones are under him: he spreadeth sharp-pointed things upon the mire." This refers to the scales, which are sharp-edged. "He maketh the deep to boil like a

pot : he maketh the sea like a pot of ointment. He maketh a path to shine after him ; one would think the deep to be hoary. Upon earth there is not his like, who is made without fear. He beholdeth all high things : he is a king over all the children of pride."

The crocodile is an inhabitant of the Nile, Ganges, and other large rivers of Asia and Africa, and is generally found in the lakes and marshes of warm climates, sometimes swimming out to a considerable distance at sea. The skull of the crocodile is remarkably hard and solid, and the snout oblong, obtuse, and flattened. The eyes are large, placed far back on the head, with well-developed eyelids. The mouth is very wide, and when open exposes to view a very formidable array of teeth of a simple, conical form, adapted rather for the securing and tearing of the prey, than for the cutting, crushing, and grinding of it ; for crocodiles are carnivorous, and simply swallow any animal which they have caught, as a whole, if small enough, or in pieces, if too large, after having first deprived it of life.

The upper part of the body of the crocodile is covered with numerous large, square, bony plates, forming an almost impenetrable coat of mail for the back ; the belly and flanks are overspread with scales, these being the most vulnerable parts of the reptile. The movements of the crocodile on shore are very awkward ; the legs are short, stout, and hardly capable of supporting the weight of the body when out of the water ; besides, they are badly formed for running on the land, although well adapted for swimming, the toes of the hinder feet being webbed for that purpose. Hence, in the water the crocodile darts along with great rapidity in any direction, being greatly assisted in all its motions by the action of the tail, which serves like the helm of a ship in directing the forward or side movements of the body. On the land, on the contrary, the crocodile has considerable difficulty in turning the body, and is compelled to run forward in nearly a straight line ; its pursuit is therefore very easily avoided by the process of doubling, or a sudden turning to the right hand or the left.

The crocodile of the Nile attains a length of from twenty-five to thirty feet, and is unquestionably the most formidable and ferocious of aquatic reptiles. Yet this formidable reptile is endowed with natural instincts and habits which render him one of the greatest benefactors of the human race. He may be regarded as the largest, most active, and useful of the numerous scavengers of the rivers and marshes of hot climates. In tropical and sub-tropical countries, where the heat is excessive, putrefaction advances with such rapidity, that the pestilential effluvia of decaying carrion would contaminate the atmosphere, spreading everywhere sickness and death amongst the inhabitants of the numerous towns and cities on the banks of tropical rivers, were it not for the labours of the crocodile and the alligator, which devour the bloated remains of thousands of animals floating in these rivers to the ocean. And so strong is their natural instinct for carrion as food, that they are said to bury the fresh remains of any animal which they have killed, and do not touch it until it becomes putrescent. Apart from any supplies of carrion, the food of the crocodile consists to some extent of fish; but any animal that comes within reach is equally welcome, and there are numerous well-authenticated cases of children and men having been seized by this reptile whilst bathing. When there is no carrion, therefore, the crocodile resorts to these attacks in order to procure food. It lays hold of the water-fowl on the surface of the stream, or, swimming quietly to land, suddenly seizes with its powerful jaws a larger animal, such as a dog or a pig, and immediately plunges again into the river, and in order to drown its victim, sinks to the bottom, where it remains until the prey is dead.

The crocodile is an oviparous animal. The eggs of the female are laid in warm, sandy places, or in a heap of mud or vegetable matter, where they are hatched by the heat of the sun. These eggs are the favourite food of the ichneumon of Egypt, an animal closely allied to the civet cat from whence the perfume is obtained. The ichneumon finds out the place where the eggs have been deposited, and by devouring them, and also the young crocodiles

when newly hatched, performs a valuable service to the country and its inhabitants, by keeping down the multiplication of this formidable animal within proper bounds. The ichneumon is easily domesticated, and, like the domestic cat, forms an attachment to the house in which it lives, which it clears of mice and rats.

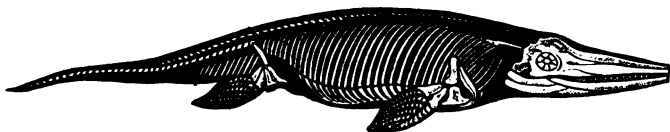
There are other passages of Scripture besides Job xli. in which the crocodile is mentioned. The word *leviathan*, indeed, will not always prove a safe guide ; for we have already seen (p. 59) that this term is occasionally used with another meaning. In Job iii. 8 (see margin), and in Psalm lxxiv. 14, the crocodile is no doubt intended ; in Isaiah xxvii. 1, it may be doubted whether *leviathan*, is the crocodile or some snake of large size.

There is, however, another word which in some cases seems certainly to denote the crocodile. This word (*tannin*) has already been dealt with in the article on the whale (p. 59). Instead of *whale* or *dragon*, we must read *crocodile* in Isa. li. 9, Ezek. xxix. 3, xxxii. 2, and perhaps in Psalm lxxiv. 13, Isa. xxvii. 1.

As the word "dragon" has been referred to more than once, it may be well to add a few words of general explanation. The word is found in our Bibles more than thirty times, twenty-one times in the Old Testament, and thirteen in the New. In thirteen of these passages the meaning is really *jackal*, and the reader will find a notice of all these texts on page 40. Four more (Psalm lxxiv. 13 ; Isa. xxvii. 1, li. 9 ; Ezek. xlix. 3) have just been explained. In Psalm cxlviii. 7 (and perhaps in Psalm lxxiv. 13) the word means *whale*, or some other huge inhabitant of the deep (see p. 59). There remain but three passages in the Old Testament, viz., Deut. xxxii. 33, Psalm xci. 13, Jer. li. 34 ; here, probably, some large land-serpent was intended by the sacred writers. In the New Testament we find "dragon" only in the figurative language of the Book of Revelation.

This notice of the *Reptilia* would be incomplete without some reference to the strange forms and gigantic proportions of fossil reptiles discovered in the lias formation at Lyme Regis in Dorset.

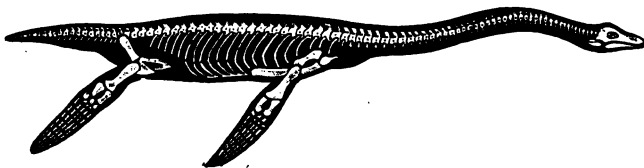
shire, and in other parts of England. The one found at Lyme has been called the ichthyosaurus, or fish-lizard (Gr. *ichthus*, a fish, and *sauros*, a lizard). It combined in its structure the head of a gigantic lizard, the teeth of a crocodile, the paddles of a whale, and the vertebræ or backbone of a fish. The eye was of enormous magnitude, far surpassing that of any animal now living, and the arrangement of its parts such as to give an immense extent and power of vision. The fish-like form of the body was prolonged behind into a lengthened tail, which, with the four



The Fish-lizard.

paddles, probably formed the chief organs of locomotion; the head was also produced into a long and pointed snout. From eight to ten species of these reptiles have been discovered, and hundreds of individuals, varying from four to forty feet in length. They were marine reptiles preying upon fishes, as is evident from the scales and bones found in the hardened masses of their food, and in their fossil excrement, the well-known coprolite (*kopros*, dung, and *lithos*, a stone), now one of our best fertilizers.

The *Plesiosaurus* (from *plesion*, akin to, and *sauros*, a lizard) was more nearly allied to a lizard than a fish, as the name intimates.

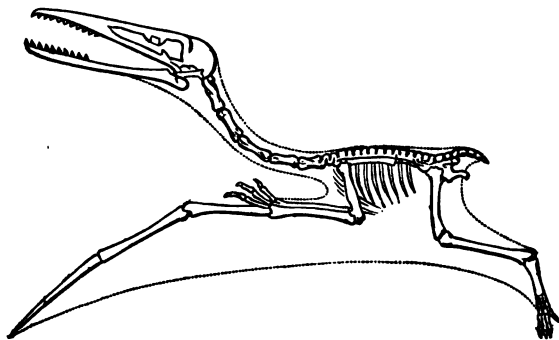


The Plesiosaurus.

This reptile had a small-sized head, supported at the extremity of a long, snake-like, flexible neck; the tail and body were shorter,

and the paddles proportionately larger than those of the ichthyosaurus. "To the head of a lizard," says Dr. Buckland, "it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent, the ribs of a chameleon, and the paddles of a whale." It is supposed by naturalists to have paddled itself on the surface of the water, arching back its long neck like the swan, and occasionally darting it down at the fish and other marine animals coming within its reach. The neck had no less than forty vertebræ in some species; a greater number than exists in any animal now living, the swan having but twenty-three. Found in the lias with the ichthyosauri.

The *Pterodactyle* (from *pteron*, a wing, and *daktulos*, a finger) or wing-fingered reptile, so-called from being furnished with membranous wings, resembled a gigantic bat, and was capable not only of swimming through the water, but of flight through the air. The neck is composed of stout vertebræ, and the vertebral column



The Pterodactyle.

terminates in a short tail. At the extremity of the fore-arm is a hand, composed of three or four short, slender inner fingers, and of an exceedingly long outer finger, equal to the body and neck in length. The nose was elongated like the snout of a crocodile, the eyes of enormous size, and the mouth armed with conical teeth. Abundant in the oolite.

It is probable that these reptiles lived upon insects, as insect remains have been found with the bones of pterodactyles near Oxford. They also may possibly have fed upon fish, darting down upon them from the atmosphere. About eight species are known, varying from a snipe to a cormorant in size.

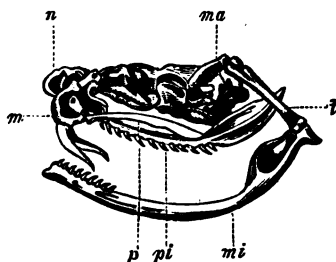
ORDER III.—OPHIDIA, OR SERPENTS.

These animals have been in all ages the object of general aversion and dread. Their stealthy creeping movements, and the really poisonous nature of some of them, has brought disgrace on the entire order, although most of the species are entirely harmless. According to Schlegel, there are at present 265 known species, and of these only fifty-eight are venomous, so that the proportion of harmless to venomous species is nearly as four to one. Like all the other reptilia, they increase in numbers and size towards the equator, or hottest part of the earth, whilst they are comparatively few and diminutive in the colder temperate zones. They do not appear to advance so far northwards as frogs and lizards. There is much beauty in the markings of many snakes, grace in their movements, and, above all, simplicity in their anatomical structure, which is well calculated to excite our interest in them.

In the snakes we have the vertebrated skeleton developed in man, beasts, birds, and fishes reduced to the greatest possible state of simplicity. A snake or serpent is in fact only a living spinal column to which the head is attached, and from which the limbs have been removed. In this structure the spinal column, or back bone, is developed to a maximum, whilst the limbs are reduced to a minimum. There are only thirty-three joints, or vertebrae (Lat. *verto*, I turn), in the back bone of man, whilst in snakes the number is greatly increased. About 200 exist in the spinal column of the rattlesnake, and in that of the viper even 300 are said to have been counted, and all are articulated with each other by the ball and socket, or universal joint, so called, as it admits of the

greatest freedom of motion in every direction. The body of a snake is thus capable of assuming every variety and degree of curvature on the ground, or round a tree or other object about which it coils itself.

Another circumstance in the anatomy of snakes, which gives additional mobility to their bodies, is the fact that they have no sternum, or breast bone. The ribs, therefore, which arch forward from the spinal column behind in pairs, have their extremities in front free and movable, and these points or extremities form admirable substitutes for feet, coming forward in succession, like the feet of a caterpillar, or the numerous feet of a centipede, and thus enabling the animal to glide silently and rapidly over the ground. The scales also, which are capable of muscular erection, assist the snake in locomotion, and prevent its capture; for when a snake is caught by the tail, in endeavouring to escape, through the grass beneath bushes, on feeling the grasp it erects all its scales, opposing their edges so effectually by hitching them to the rough substances beneath its body, that it usually succeeds in slipping through the hand and escaping.



The Skull of a Rattlesnake. *n*, nostrils; *ma*, mastoid bone; *t*, tympanic bones; *mi*, lower jaw; *pi*, upper jaw; *p*, palatine bones and teeth; *m*, movable fang, with poison reservoir.

Snakes live by the capture of other animals, which they swallow as a whole, either after first depriving them of life, or else living. The bones of the head and face have evidently been

formed with this object in view, being united together, not by osseous, but by cartilaginous tissue, and are therefore capable of separating from each other, and thus the cavity of the mouth and the throat, or gorge, becomes susceptible of enlargement to an enormous extent. A snake thus becomes capable of swallowing an animal even larger than itself; indeed, they sometimes seize on animals which are too large for them, in which case they invariably fall victims to their own voracity. The structure of the teeth, all of which are conical, sharp-pointed, and curve inwardly, pointing downwards towards the gorge, or throat, is such as to show that it is impossible for them ever to reject by the mouth what has once got into their throat; also, that snakes are only capable of swallowing their food as a whole, and are utterly incapacitated for crushing, grinding, and mastication.

The *Ophidia*, or serpents, may be subdivided into three classes: 1. The *Viperina*, or essentially venomous snakes, as the viper and rattlesnake, with weak jaws, the upper being wholly devoid of teeth, except the two large poison fangs, constituting perhaps the most terrible weapon of attack met with in the animal creation. The remainder of the teeth of the *Viperina* consist of two rows in the palate, generally of small size and weak. 2. The *Colubrina*, or harmless snakes, as our two British species, viz., the ringed snake (*Coluber natrix*), and the smooth snake (*Coluber laevis*); comparatively speaking small snakes, many species of which habitually frequent trees, feeding on insects and small birds, and found in all parts of the world. 3. The family *Boidæ*, or boas, large and powerful snakes, restricted to tropical countries.

The viperine, or essentially venomous snakes, and the family *Boidæ*, or boas, kill their prey before they swallow it, the former by the venomous bites with which they make their attack, and the latter by the powerful compression of the bodies of their victims, about which they entwine themselves. But the colubrine, or harmless snakes, swallow their prey alive, the ringed snake especially frogs, and this makes the death-battle of the struggling animal a

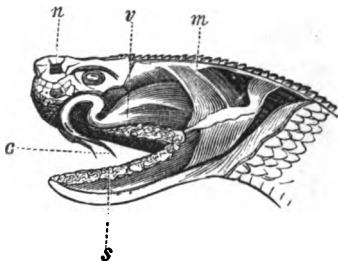
somewhat painful scene, the struggle against the down-swallowing being sometimes prolonged for hours.



The Boa.

Of the British snakes, only one species is poisonous, viz., the viper (*Pelias berus*), which is much smaller than the others, being seldom more than two feet long, whilst the smooth and ringed snakes are from four to six feet in length. It is also easily distinguished from them by its short triangular head, and by a dark-brown zigzag streak on its greenish-grey or brown upper side, which runs along the whole length of the back.

These poisonous snakes have two hollow poisonous teeth or fangs in the upper jaw, through which is a canal for conveying the contents of the poison glands situated at the base of the teeth, which is forcibly ejected into the wound as soon as the animal bites. When not in use, they lie flat upon the roof of the mouth, concealed by a fold of the skin. When the animal is irritated, the poison fangs are erected in a moment, and the powerful muscles which elevated them compress the poison bag when the animal bites, so that the reader can imagine how forcibly the poison is driven through the poison teeth into the wound.



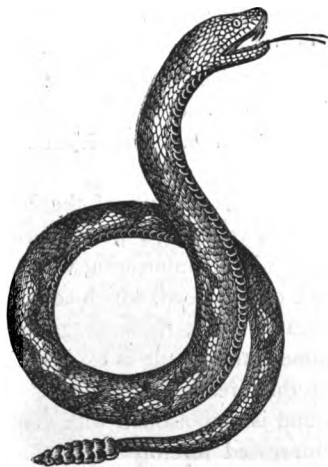
Poison Apparatus of Rattlesnake. *n*, nostril; *v*, poison gland; its duct terminates in the large movable tooth or fang, *c*; *m*, muscles which raise the lower jaw and compress the poison gland; *s*, salivary glands.

The poison itself may be swallowed without danger, but introduced into the blood in sufficient quantity, it causes death with frightful rapidity. Dogs are sometimes bitten by vipers. At a recent meeting of the Zoological Society, Mr. Yarrell stated that when out shooting he had seen two dogs bitten by them. The symptoms were very distressing. The dogs' heads swelled up, and they were unable to proceed, and although they recovered from the immediate effects of the bite, they were never afterwards of the least use.

In one genus of poisonous serpents, there exists a provision which puts the unwary on his guard when he gets into the neighbourhood of the dangerous reptile. We allude, of course, to the rattlesnake, *Crotalus horridus* (Gr. *krotalon*, a rattler, and

Lat. *horridus*, horrid). This serpent is wholly American, but we have chosen it because it clearly illustrates the poison apparatus of the viper, Egyptian naja or asp, and other venomous snakes. Its tail is terminated by a series of horny rings, loosely put together, which rattle with the slightest movement of the animal when it lies concealed, so that its presence is at once made known. These horny rings increase in number with the age of the reptile, which is said to acquire an additional one with the casting of each skin. See engraving below.

Among the poisonous snakes is one which possesses a classical and historical, as well as Biblical interest, the asp, or Egyptian cobra di capello (*Naja haje*). This reptile belongs to the section of poisonous snakes, and to that division of them named the *Viperidae*, or vipers. Of the genus *Naja*, several species are known—the Indian naja, or true cobra di capello, or spectacle snake, which has a curious mark, resembling a pair of spectacles, on the loose skin of its neck (*Naja tripudians*); and the Egyptian naja,



The Rattlesnake.

which is closely allied to the cobra di capello, having a similar loose skin about the neck, but without the singular spectacular mark there of the Indian species. These creatures have the habit of inflating the loose skin of their necks when excited, and, at the same time, of elevating themselves. This last species is figured in our engraving, p. 207. The name cobra di capello, given by the Portuguese originally to the Indian naja, has long been used as a general title for all the species.

The Egyptian cobra is one of the fiercest and most venomous of snakes. It never runs away from an assailant, but always stops and shows fight, and not unfrequently commences the attack itself, rising on the posterior portion of its body, elevating its head,

expanding the hood or loose skin of its neck, the scales of which are forced to a great distance apart, hissing loudly, protruding the fangs, and showing, by the bright glance of its eye, its boldness and resolution. If the object of attack approaches within striking distance, the cobra darts out, and with the rapidity of lightning plunges its poison-fangs into the body of its victim. No sooner does the poison enter the circulation than the avenues of sense begin to close for ever on the outer world, the eyes grow dim, the hearing fails, the tongue falters, the breathing gradually becomes less and less, the firm, healthy pulsations of the heart are reduced to a few feeble flutterings, the limbs grow cold and ultimately motionless, and in half an hour, a quarter of an hour, or it may be only ten minutes, death supervenes, followed by rapid putrefaction.

The poison teeth of these serpents consist of a single pair of long curved fangs, perforated throughout, attached to the upper jaw, and communicating with a large poison gland, situated at the back of the head, which secretes the venomous fluid. When the cobra is quiet, these fangs are laid flat in the mouth; but the moment the reptile is excited they immediately become erect, and are then ready for action. As soon as the serpent bites, the wound is empoisoned with venom from the poison-gland, which is compressed forcibly in the act of biting, and thus ejects its poisonous contents through the canal in the tooth into the wound.

Various means have been resorted to for preventing the injurious effects of the bite of these reptiles. The natives of the countries where they are found have their favourite remedies, upon which, however, not much dependence is to be placed. The best method is to prevent, if possible, the poison from getting into the circulation by immediately sucking the wound with the mouth—which may be safely done, as the poison is innocuous when taken internally—or cauterizing or cutting out the wounded part. This must be done at once; for if any time is allowed to elapse, all the distressing effects of the poison, already mentioned, will begin to manifest themselves.

Both the Indian and the Egyptian cobras are carried about by the jugglers of their respective countries for exhibition, their fangs having been previously removed, so as to render them harmless. They are then taught to raise the fore part of their body in the attitude which they usually assume when about to strike, and to keep time by a graceful motion of their head from side to side, to the sound of some simple musical instrument such as a flute.



A Serpent Charmer.

The trade of serpent-charming is very ancient, and was practised in Egypt in very early times. It is clearly referred to in the Hebrew Scriptures, which of itself is quite enough to prove its antiquity. See Ps. lviii. 4, 5 : "They are like the deaf adder that stoppeth her ear ; which will not hearken to the voice of charmers, charming never so wisely." See also Eccles. x. 11, Jerem. viii. 17. That poisonous snakes may be brought under the influence of music is placed for ever beyond dispute by the testimony of such eminent travellers as Bruce, Lane, and Major Denham. The following paragraph is quoted from Denham's "Discoveries in Africa," vol. ii. pp. 292, 293 :—

“Early this morning two jugglers came to my door. Two snakes were let out of a bag, when one of the jugglers began to beat a little drum. The snakes immediately reared themselves on their tails, and made a kind of sham dance. The juggler afterwards played various tricks with them, sometimes wreathing them round his neck, coiling them in his bosom, or throwing them among the people. On pointing his finger at their mouth, they immediately raised themselves up in an attitude to spring forward ; but after having exasperated them to the utmost, he had only to spit in their face to make them retreat quite crest-fallen. I measured one of them ; it was six feet three inches long. The venomous fangs had been extracted ; but still, to guard against all possible injury, the fellow who played tricks with them had a large roll of cloth wound round the right arm.”

The Egyptian jugglers, by compressing the neck of the cobra, produce a kind of catalepsy, which renders it stiff and motionless. This is rather a curious fact, when considered in connection with the scriptural narrative in the seventh chapter of Exodus, where the rods of the magicians, when thrown down, are converted into serpents. The cobra is frequently sculptured in the architecture of the ancient Egyptians. From its habit of elevating itself when approached, it was regarded by them as the protecting divinity of the world, and its figure is therefore usually found sculptured on each side of a globe on the outside of their temples. This snake possesses likewise a classical as well as historical interest, associated as it is with the death of Cleopatra, the famous queen of Egypt.

In almost all places in the Scriptures the word “serpent” (*nachash*) is used in a general sense, without reference to any particular species. In Deut. xxxii. 24, “I will also send the teeth of beasts upon them, with the poison of serpents of the dust,” the word is different, but the meaning is still general (creeper, crawler). In three places the word is *tannin*, which properly denotes a sea-monster, or large creature of the sea. In these three places, Exod. vii. 9, 10, 12,—in the description of the contest of Moses and Aaron before Pharaoh with the Egyptian

magicians, whose rods are cast down and become serpents before that monarch, Aaron's rod in its serpentine form swallowing up the rest,—the word denotes a large and deadly land serpent; as it does in Deut. xxxii. 33, "Their wine is the poison of *dragons*, and the cruel venom of asps;" Ps. xci. 13, "Thou shalt tread upon the lion and adder, the young lion and the *dragon* shalt thou trample under feet;" and perhaps in Jer. li. 34, where the same word *dragon* is used. The fiery serpents which bit the Israelites in the wilderness (Numb. xxi. 6, 8, and Deut. viii. 15)—so called from the inflammatory effect of the bite—were probably either the cerastes or the Egyptian cobra.

In Isa. xiv. 29, and xxx. 6, the epithet "fiery flying" serpent is used. This can hardly refer either to a colubrine snake, or the flying lizard (*Draco volans*), for these creatures are harmless. "Flying" may be only a poetical expression for "swiftly darting."

In the New Testament the word serpent usually has a general meaning; once (James iii. 7), "For every kind of beasts, and of birds, and of *serpents*, and of things in the sea, is tamed," etc.; the word *serpents* is used, when *creeping things* is the correct translation.

The word viper occurs three times in the Old Testament, and represents a Hebrew word derived from "to hiss." What species is intended is doubtful. In the New Testament the word occurs five times; but in most instances it is used in a general sense. In the account of Paul's shipwreck on the island called Melita (Acts xxviii.), it is recorded that the barbarous people treated the apostle and his companions kindly; v. 3, "And when Paul had gathered a bundle of sticks, and laid them on the fire" which the people had kindled, "there came a viper out of the heat, and fastened on his hand;" and that Paul "shook off the beast into the fire, and felt no harm." This reptile was either the *Vipera aspis*, or the common viper or adder which we have already described (*Pelias berus*). Vipers are not now found in Malta; but so much forest has been cleared that we cannot wonder at the disappearance of noxious snakes. Besides, it must not be forgotten

that we are by no means sure that the Melita of Acts xxviii. is really Malta.

The word adder occurs five times, once representing *achshub* (Ps. cxl. 3), "They have sharpened their tongues like a serpent; adder's poison is under their lips;" twice *pethen*, usually rendered asp (see below); once *shephiphon* (Gen. xlix. 17), "Dan shall be a serpent by the way, an adder in the path, that biteth the horse heels, so that his rider shall fall backward;" once *tsiphoni*, which is usually rendered *cockatrice* (Prov. xxiii. 32), "At the last it biteth like a serpent, and stingeth like an adder."

Cockatrice occurs four times, representing one Hebrew word in two forms).

Asp occurs four times in the Old Testament for one Hebrew word, and probably denotes the Egyptian cobra. In Rom. iii. 13, "The poison of asps is under their lips," it occurs as a quotation from Ps. cxl. 3, which we have noticed under "adder."

Hence, setting aside general terms, we have—

(1) The fiery serpent of Numbers xxi. 6, 8, and Deut. viii. 15, which bit the Israelites in the wilderness.

(2) The fiery flying serpent of Isaiah xiv. 29, and xxx. 6, probably a poetical expression for a swiftly darting serpent.

(3) The viper in the Old Testament,—perhaps the Algerine adder, or more probably the sand viper; and the viper in the New Testament, either the common viper (*Pelias berus*) or the *Vipera aspis*.

(4) The word rendered "adder" in Ps. cxl. 3, and quoted as "asp" in Rom. iii. 13. This is some species of viper.

(5) The word rendered "asp" in Deut. xxxii. 33, Job xx. 14, 16, Isa. xi. 8; and "adder" in Ps. lviii. 4, xci. 13; probably the Egyptian cobra.

(6) The word rendered adder in Gen. xlix. 17, "Dan shall be a serpent by the way, an adder in the path" (margin, arrowsnake), the horned viper, *Cerastes hasselquistii* (said to be Cleopatra's asp).

(7) The word rendered adder in Prov. xxiii. 32; cockatrice in

Isa. xiv. 29, xi. 8, "And the weaned child shall put his hand on the cockatrice' den;" Isa. lix. 5, "They hatch cockatrice' eggs;" Jer. viii. 17, "For behold I will send serpents, cockatrices, among you, which will not be charmed." Here the reptile is possibly the Algerine adder, but more probably the great yellow viper (*Daboia xanthena*).

The cerastes, or horned snake (*Cerastes hasselquistii*), found very plentifully in the dry sandy deserts of Egypt, Syria, and Arabia, is a small snake, generally measuring from a foot to fifteen inches in length, although some specimens are more than two feet long. Above each eye, in the male, there is a sort of horn-like process, with the point directed a little forwards, which adds greatly to the malignity of the creature's aspect, although it cannot be regarded as a weapon of any kind. This species of asp is celebrated as having supplied Cleopatra with that poison by which means she ensured her liberty as a queen at the expense of her life. The cerastes is very active in its movements, and will spring to a distance of three feet and more when making its attack. It is remarkable for its almost total abstinence from water.

ORDER IV.—BATRACHIANS, OR FROGS.

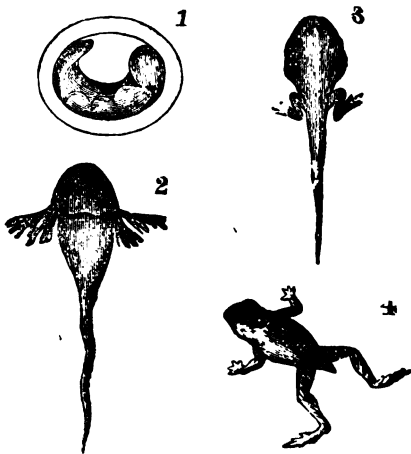
The batrachian reptiles are divided into two sections, 1. *Urodela* (Gr. *oura*, a tail, and *delos*, apparent), which preserve their tails in the adult state; example, the common smooth newt and the great warty newt of the ponds. 2. *Anoura* (Gr. *an*, without, and *oura*, a tail), or batrachians which lose their tails in the adult state, and retain them only in the tadpole condition; example, frogs and toads. Those that retain their tails walk badly on the land, and are usually found in the water, whilst those that lose them are generally met with on the land, over which they can crawl or leap with facility. These two last reptiles are therefore the most highly organized of the batrachians. In the Scriptures we have to do with the anoura, or tailless batrachians. The common frog (*Rana temporaria*) is a cold-blooded, vertebrated animal, whose

temperature depends on that of the medium in which it lives, and which consequently becomes torpid and inactive in winter. The respiration of frogs is aerial and incomplete, their blood being only partially oxygenated, for the venous blood is returned to the heart, which has two auricles and one ventricle, and therefore becomes mixed with the arterial blood, thus tainting its purity. There is hardly a cattle pond or a stream in England where the frog may not be found either on its margin or swimming in its waters.

The eggs of the frog are usually deposited towards the end of the month of March. At this season they go into the water to spawn. The ova or spawn is deposited in the form of double necklace-like chains, or strings of beautifully transparent gluten of the length of three or four feet, having the appearance throughout their entire length of so many small jet-black globules or beads, which are in reality the tadpoles, or larvæ, waiting for the period of their evolution, or hatching. This frog-spawn at first sinks to the bottom of the pond or stream where it is deposited; but the gelatinous covering of the eggs absorbs water, and each cluster therefore swells, and, ultimately becoming specifically lighter than the water, rises to the surface. The development of the tadpole commences in the little black globes or centres. At first the head becomes prominent, a flattened tail is produced, and also bronchial tufts, two on either side of the head, which imbibe oxygen from the water like the gills of a fish. The little animal now feels uncomfortable in its curved position, and therefore struggles until it has freed itself from its gelatinous surroundings, through which it eats its way, and commences active life as a tadpole in the water.

These tadpoles, or young frogs, resemble fishes with large heads, and are generally called by boys Bullheads; they breathe, in fact, through gills like fishes, feeding greedily upon the duckmeat (*Lemna*) which mantles the surface of the pool. But when they leave the water and become frogs, they lose their gills, and acquire lungs, thus gradually becoming adapted to their new life in the atmosphere. These curious life changes well deserve to be

studied. The bullheads so common in pools and stagnant water towards the end of March, are the larvæ of young frogs and toads ; they gradually lose their tails and acquire feet, lose their gills and obtain lungs, and then leap ashore. The whole of this curious metamorphosis or change of structure, as well as of habits of life, may be watched by keeping a few tadpoles in a basin of water. The circulation of the blood may be beautifully seen in the transparent tail of the tadpole, if placed on the stage of the microscope ; a double stream of blood globules going up one side and returning down the other, every blood globule being distinctly visible.



1. Embryo frog enclosed in jelly and curled upon itself. 2. Tadpole with tail and tufted gills. 3. Disappearance of gills, development of hinder feet. 4. Fore feet formed and the tail almost wholly absorbed.

And now, instead of an aquatic animal breathing by gills, and feeding on vegetables, we have a terrestrial animal, breathing by lungs, and altogether carnivorous. Its food now consists of insects and various kinds of slugs, of which it destroys incredible quantities ; it is therefore very useful to the farmer, as it aids in the preservation of his crops by destroying the enemies which attack them. Frogs, for this reason, whenever met with, should not be molested. And the same remarks apply to that much maligned and despised animal, the common toad (*Bufo vulgaris*), which is not poisonous, but, on the contrary, as harmless and useful as the frog, and equally entitled to our kindly consideration, as both reptiles are constantly occupied in feeding on insects and worms, and thus destroying a great deal of noxious vermin.

- These reptiles should not, therefore, be cruelly and ignorantly put to death, but encouraged about the farm and garden.



The Toad.

The toad is very similar in general appearance to the frog, to which it is closely allied, but is easily distinguished from it by its warty skin, short hinder limbs, and habitual crawl.

Like other reptiles, the toad sheds its skin at certain intervals. This process is a very curious one, and Mr. Bell describes it as follows: "The old skin comes off when the new skin has been

formed beneath. It splits all along the middle of the back, exposing to view the new bright skin beneath. A corresponding division takes place along the belly. The two halves of the skin thus divided continue to recede from the centre, and become folded and rugose, and by means of the continued twitching of the animal's body are drawn down to the sides. First the hind limbs and then the fore limbs are withdrawn, and at length the whole skin is thus detached, and is now pushed by the two hands of the animal into its mouth in a little ball, and swallowed at a single gulp!"

The usual mode of accounting for the presence of toads in blocks of wood or stone is to suppose that the animal may have hidden in a hollow of the tree and become enclosed by its subsequent growths, or it may have crept into a crevice of the rock in search of insects, and by reason of its rapid increase of size, through abundance of food, have been unable to get out. Mr. Gosse, in his "*Curiosities of Natural History*," has gone into this much-discussed question very thoroughly, and we must refer our readers to that interesting volume.

The mode in which frogs and toads feed deserves notice. In both animals the tongue is doubled back upon itself, and is

covered at its extremity with a viscid glutinous secretion. This tongue is suddenly shot forth so as to touch their prey, and the latter, adhering firmly to it, is immediately captured and carried back with the tongue into the mouth. This movement is made with lightning-like rapidity, so as to be hardly perceptible without the most careful watching.

There is also a peculiarity in the respiration of the frog which



Edible Green Frog (*Rana temporaria*).

we must mention. The frog breathes by the skin as well as the lungs, which is therefore always kept moist, for this purpose, by means of constant supplies from an internal reservoir of pure water within the animal. So also, as the frog is without ribs, its breathing by the lungs is not carried on by the alternate expansion of the chest; and therefore, if the animal be closely watched, no movement of the body indicative of respiration can

be perceived. The fact is, the air is taken into the mouth through the nostrils, the mouth being shut for that purpose; the nostrils and throat are then closed, and the air is forced or swallowed down into the lungs. As this movement can only be made when the mouth is shut, it follows that when a frog is gagged, with its mouth open, respiration becomes impossible, and the animal dies of suffocation.

The frog is only mentioned in the Old Testament in connection with the plagues of Egypt (Exod. viii. 2—13), where we have the account of that miraculous visitation. Reference, too, is made in Ps. lxxviii. 45, "He sent divers sorts of flies among them, which devoured them; and frogs, which destroyed them;" also in Ps. cv. 30, "Their land brought forth frogs in abundance in the chambers of their kings." There is not a doubt about the species employed. It was the edible green frog, which, although rare in England, is common on the Continent, and abundant both in Egypt and Palestine. It is larger than our common English frog, and is differently marked and coloured. Generally it is of a beautiful green, irregularly marked with black or dark-brown spots, and ornamented on the back with three stripes of a rich golden yellow.

In the New Testament the word occurs once only, in Rev. xvi. 13.

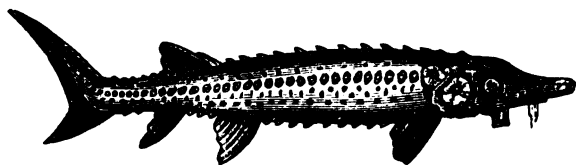
CLASS IV.—PISCES, OR FISHES.

Fishes are a class of animated beings living only in the water, to which their whole organization is most beautifully adapted. They are only mentioned in the most general terms in the Bible, no one species being described. They have been subdivided by Cuvier into two sub-classes—(1) *Pisces ossei*, or bony fishes, comprising those which have a true bony skeleton, as the herring and salmon; (2) *Pisces cartilaginei*, or cartilaginous fishes, including those in which the skeleton never passes beyond its primitive condition of gristle and cartilage, as the sturgeon and shark. The first sub-class are arranged by naturalists into:—

Acanthopterygii (Gr. *akantha*, a spine, and *pterygion*, a fin), or spiny-finned fishes. Examples: Perch, mackerel, and mullet.

Malacopterygii (Gr. *malakos*, soft, and *pterygion*, a fin), or soft-finned fishes. Examples: Salmon, carp, and trout.

The second sub-class, or cartilaginous fishes, which includes the sharks and the sturgeons (*Sturionida*), is remarkable for the imperfect development of the tail-fin. Instead of, as in the group of bony fishes, the vertebral column ceasing at the tail-fin, which is thus symmetrically divided into two equal parts, it is continued into the upper half of the tail-fin, thus rendering it asymmetrical or unequally lobed.



The Sturgeon.

In the earlier periods of the earth's history this form of tail-fin appears to have prevailed almost universally, as it is found in the remains of fossil fish which have been beautifully preserved in the magnesian limestone, and in strata of much older formation.

We shall now give a few brief details as to their structure, as illustrating "the works of the Lord and His wonders in the deep" (Ps. cvii. 24).

Fishes are the lowest class of vertebral animals, being so regarded by naturalists because their organization is characterised by so much more structural simplicity. They breathe by means of gills instead of lungs, and have, for locomotive organs, fins instead of feet. Their heart contains but two cavities, receives only venous blood, and their bodies are covered with scales. They row themselves through the water by means of their fins, which are flattened and expanded for this purpose, steering in any given direction by the movements of their tail. The reader can

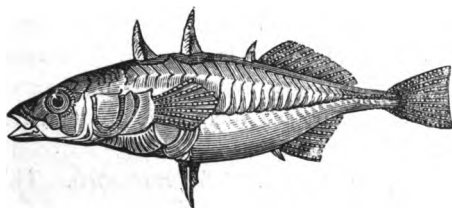
verify these facts as to their rowing and steering by observing for a few minutes the movements of the ornamental carp, popularly known as gold fish, in a globe of water. It is most probable that primæval man acquired his first ideas of navigation from observation on the mechanical effects produced on the water by the movements of the fins and tail of fishes. The tail is placed vertically, and acts on the water somewhat like the oar of the boatman, when he propels his little craft across the stream, by that alternate movement of the oar which is called sculling. The dorsal fins on the upper and the ventral fins on the under surface of the body, together with the pectoral fins, unite together in controlling every movement in the water, and in placing them in a condition of perfect ease and comfort, as is evident from their movements, now stationary, then almost imperceptible, next rapid, upwards, downwards, and in all directions, than which nothing can be imagined to be more graceful and beautiful. No lifeless mechanism which man has ever invented, however perfect his control over it, can equal the wondrous living machinery of fishes, because (Gen. i. 21) "God created great whales and every living creature that moveth, which the waters brought forth abundantly after their kind."

Most fishes have a swimming bladder situated at the lower side of their spinal column, or back bone, which always contains a greater or lesser amount of air, and which they are able to contract or expand so as to regulate the amount of air in its interior. By contracting it a portion of the air is expelled, and as their buoyancy is diminished they instantly sink downwards; by expanding it, the air is again admitted, and as their buoyancy is increased they rise upwards. It is somewhat remarkable that this air-bladder is quite rudimentary or altogether absent in fishes which live much at the bottom of the water, seldom or never coming to the surface, such as plaice, turbot, and sole. As a general rule, a fish is nearly equal in weight to its own bulk in water, or its specific gravity is about the same as that of the element in which it lives; and this circumstance, together with the mechanism of its swimming blad-

der, fins, and tail, over which it has perfect control, enables a fish to swim in the water with as much ease and safety as a bird to fly through the air.

Fishes appear to be possessed of but little intelligence. The craving for food seems to be that which gives the chief impulse to their movements. Their rapacity has no bounds whatever. Even when taken out of the water, and just expiring, they will greedily swallow the very bait that lured them to destruction. Nevertheless we find some of them endowed with instincts fitted to the requirements of their condition. There is, for example :—

The fifteen-spined stickleback, *Gasterosteus spinachia* (Gr. *gaster*, the belly, and *osteon*, a bone), a marine species which constructs a nest wherein to deposit its spawn, and afterwards guards it with watchful care until the young fry make their appearance.



The Common Stickleback.

The common three-spined stickleback of fresh water (*Gasterosteus aculeatus*), belonging to the same family of spiny-finned fishes, has a similar habit, the male collecting small fragments of vegetable matter, with which he forms a nest in which the female deposits her ova, and which he afterwards jealously guards, attacking all intruders with the utmost ferocity, and sometimes even ripping them up with those sharp dorsal and ventral spines with which he has been provided. Here then we have a fish which approaches in habits to a bird, in the attention and provision which it makes for its young.

The archer-fish (*Toxotes jaculator*). This remarkable fish is another spiny-finned fish which abounds in tropical seas, and of

which fish the perch and the stickleback are familiar examples in this country. The body is short, but compressed; the head flat above, with large prominent eyes; the snout short, the lower jaw projecting beyond the upper, and the mouth crowded with very small, short teeth. The dorsal fin is situated far back, and is furnished with four strong spines. This fish, which abounds in the Ganges and in the East India seas, throws drops of water upon insects discovered on water-plants, and thus causes them to fall into the water, where they become an easy prey. The elongation of the lower jaw of this fish doubtless greatly assists in accurately directing the liquid missile, on which it depends for its subsistence as a hunter does upon his rifle. The archer-fish is also found in the seas of Java, and is kept by the Javanese, who are well acquainted with its habits, as an ornamental fish in their houses. The general colour of the archer-fish is greenish. There are four short, dark-brown, wide, band-like spots across the back, shaded with green; below, its colour is a greenish, silvery grey. The beauty of these fishes is greatly increased by their movements in the water, and those who see them alive are delighted with their lovely and ever-changing hues.

The beaked chætodon (*Chætodon rostratus*). This is another genus belonging to the same order of spiny-finned fishes, addicted to similar habits as the Javanese archer-fish. It is a beautifully coloured ornamental fish, inhabiting the Chinese seas, having jaws prolonged into a sort of beak, which is so enclosed in the skin that only a small opening is left at the extremity for a mouth. The tubular form of the mouth of this fish enables it to squirt water with great accuracy and force at any insect conveniently near to the streams which it frequents, so as to ensure its fall into the water. The Chinese keep these fishes in basins, and amuse themselves by watching their efforts to bring down a fly suspended over them with a thread. There are so few fishes, comparatively speaking, distinguished by anything like superiority of instinct, that the rarity of such manifestations of ingenuity makes these exceptional instances all the more interesting.

The climbing perch, *Anabas scandens* (Gr. *anabaino*, to ascend, and Lat. *scandens*, climbing). This species is also a spiny-finned fish (*Acanthopterygii*). In tropical countries, during the dry season, it often happens that many rivers and ponds are dried up by the excessive heat. The respiratory organs of such fishes as the anabas have therefore been constructed so as to enable them to sustain life out of the water for a considerable space of time, and by these means they are enabled to migrate in search of their natural element. Naturalists tell us that they have small receptacles in which they are able to preserve the supplies of water with which they moisten their gills. The most celebrated of these travelling fishes is the climbing perch (*Anabas scandens*). Mr. A. Layard, the author of "Discoveries in the Ruins of Nineveh and Babylon," once encountered several of these fishes travelling along a hot, dusty road in the mid-day sun; and Daldorf, a Danish zoologist of reputation, asserts that he has seen this species in the act of climbing palm-trees, and effecting its ascent by means of gills and tail, with the aid of its spinous gill-covers. Other naturalists have also mentioned the fact of its crawling up the banks and living out of the water.

Sir Robert Schomburgh tells us that certain species of Dora, in Guiana, have the same habit, and are occasionally met with in such numbers on their terrestrial travels that the negroes fill baskets with them. These fishes, provincially called Hassars, proceed nearly as fast as a man can walk, the strong scaly bands which envelop their bodies greatly facilitating their progress over the ground. If they fail in finding water, it is said that they burrow in the still soft mud, and pass the dry season in a state of torpidity.

Fishes were an article of food and commerce in very early times. The Israelites when in bondage in Egypt were fed largely on fish, as is evident from their complaint to Moses after their deliverance (Numb. xi. 4, 5), "Who shall give us flesh to eat? We remember the fish which we did eat in Egypt freely." The subsequent use of fish by the Jews is shown by the fact that, in the Jerusalem built before the captivity in Babylon, and subsequently rebuilt after

their return to Palestine, there was a fish market, and that the gate opening into that market was called the Fish-gate. (See 2 Chron. xxxiii. 14, and Neh. iii. 3.)

On referring to the New Testament we find that our Lord's disciples were fishermen (Matt. iv. 18—20); that He fed in a desert place 5,000 men, besides women and children, with five loaves and two fishes, His disciples taking up twelve baskets full of the fragments that were left (Matt. xiv. 15—21); and afterwards 4,000 men, besides women and children, with seven loaves and a few little fishes in the wilderness (Matt. xv. 32—38); and that He partook of bread and fish Himself with His disciples after His resurrection (John xxi. 5—13). See also especially Luke xxiv. 41—43, where it is said, that "they gave Him a piece of a broiled fish and of an honeycomb."

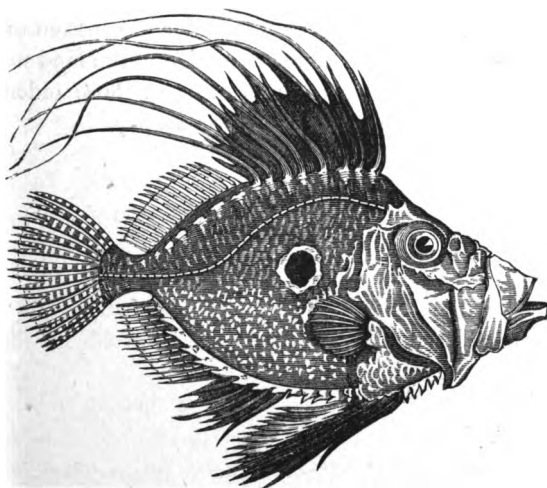
The only restriction in reference to fish as an article of food in the Mosaic code is the rule that the fish eaten must have fins and scales (Lev. xi. 9, 10), all without them being forbidden, the eel and the lamprey, for example.

The various modes of capturing fish both in modern and ancient times are also referred to, as for instance :—

The hook and line. This is mentioned Job xli. 1, "Canst thou draw out leviathan with an hook? or his tongue with a cord which thou lettest down?" See also Christ's orders to Peter, who, although he gave up all to follow his Divine Master, still appears to have kept his fishing equipments by him (Matt. xvii. 27): "Go thou to the sea, and cast an hook, and take up the fish that first cometh up; and when thou hast opened his mouth, thou shalt find a piece of money: that take, and give unto them for me and thee."

Roman Catholic legends point to a species of fish known as the John Dory (*Zæus faber*), and allied to the mackerel family (*Scomberidæ*), as the fish from which St. Peter took the tribute money; the black marks on its sides being ascribed to the pressure of the Apostle's fingers. Hence it is known in several countries of Europe as St. Peter's fish; although the had;

dock, which also exhibits a blackish mark on each side of the body, is considered by many to dispute its title to this honour. The most probable origin of the popular name of this fish is from the French *dorée* or *jaune dorée*, which refers to its golden yellow colour when fresh.



The John Dory.

Fishing with the spear. This was common in ancient times. It is mentioned in Holy Writ (Job xli. 7), "Canst thou fill his skin with barbed irons? or his head with fish spears?"

Fishing with the net. This is an old practice, and is therefore frequently referred to both in the Old and New Testament. In Eccles. ix. 12, "As the fishes that are taken in an evil net, so are the sons of men snared in an evil time, when it falleth suddenly upon them." It is mentioned by the prophets (Isa. xix. 8), "The fishers also shall mourn, and they that spread nets upon the waters shall languish." Fishing with the net is also mentioned in the New Testament. "Simon called Peter and Andrew his brother" were "casting a net into the sea," and "James the son of Zebedee

and John his brother" were "mending their nets," when called by Christ to the discipleship ; and Christ Himself alludes to it in His well-known parable (Matt. xiii. 47, 48) : " Again, the kingdom of heaven is like unto a net that was cast into the sea, and gathered of every kind ; which, when it was full, they drew to shore, and sat down, and gathered the good into vessels, but cast the bad away." It is worthy of remark that the net is frequently spoken of in the Old Testament, where the reference is made to the land-nets used for the purpose of ensnaring wild animals in those olden times, a practice still continued even at the present day.

PART II.

INVERTEBRATED ANIMALS.

CHAPTER I.



THE second grand division of the Animal Kingdom is included under the sub-kingdom Invertebrata, and embraces all animals destitute of a cranium, or skull, and of a vertebral column, or a backbone. The first class of invertebrated animals is that of

I. THE MOLLUSCA, OR SOFT-BODIED ANIMALS.

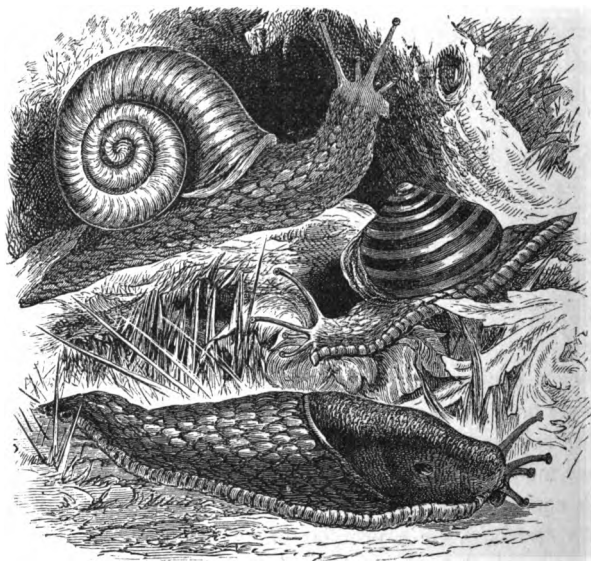
Having a distinct pulmonary or bronchial circulation, breathing by lungs or gills, having white or bluish blood, and in most cases a shell covering, in which the animal resides. This is formed by the mollusc as it is required, being secreted in univalves, or shells consisting of one piece, such as the common garden snail (*Helix hortensis*), by a peculiar organ termed the collar; and in bivalves, or shells composed of two pieces, such as the common oyster, by the cloak or mantle, so called because an external fold of the skin is loosely reflected over the body like a cloak or mantle. In the engraving both kinds of molluscs are represented; the slug (*Limax*), and the shell-bearing mollusc (*Helix*).

Of the six orders into which this class has been divided by naturalists only two are referred to in the Scriptures.

I. THE GASTEROPODA, OR BELLY-FOOTED MOLLUSCS (Gr. *gaster*, the belly, and *pous*, a foot), have a distinct head (*Encephalous*), and crawl along with a sort of a gliding motion, by means of a broad

muscular disc on the lower surface of the body, which serves as a substitute for legs. Now the slug (*Limax agrestis*), and the common banded snail (*Helix hortensis*), so abundant in our fields, gardens, and beneath our hedge-banks, may be regarded as typical forms of this order, and one or both are most certainly referred to in the Scriptures.

THE SLUG (*Limax agrestis*). Most of our readers will be sur-



The Gasteropoda, or Belly-footed Molluscs.

prised to learn that there is even in the slug a horny rudiment of a shell, which lies concealed from vulgar eyes beneath the mantle, and is only visible to men of science, who look, not only in this case, but in many others, below the surface of things. In this instance, therefore, the mollusc, being without a visible shell, is said to be *naked*. But in the case of the garden snail (*Helix hortensis*), the rudimentary shell of the mollusc becomes so much

increased in size that any one can see it growing with the growth of the mollusc, so that in every stage of its life, from youth to old age, the contracted animal can find a home and a shelter within it. Hence the slug or snail, which thus "carries its house on its back," is called in science a testaceous mollusc (Lat. *testa*, a shell). In our engraving both kinds of molluscs are represented.

Now in the slug, of which there are several distinct species, we observe a prominent head with four tentacles, which are retractile, and may be drawn in or pushed out, as occasion requires, like the fingers of a glove. At the end of the longest pair of tentacles is a little black spot on each, the two eyes of the snail, which contain a crystalline lens, and more or less traces of a vitreous body; there is also a pair of auditory vesicles containing otoliths (Gr. *otos*, of the ear, and *lithos*, a stone), or ear-stones, chalky concretions of an irregular form, placed at the base of the tentacles, doubtless intended to render the vibrations of sound more sensible. These ear-stones are either in immediate contact with the brain, or connected with it by a short nerve. No special organ of smell or taste has been detected in the mollusca, although from the discrimination shown in the selection of food, they are in undoubted possession of both these senses. As to the sense of touch, they do not appear to possess it in any high degree; for they allow their skins to be eaten by other slugs, and even in spite of large wounds produced show no signs of pain. Hence they possess in a high degree the power of repairing lost parts. But although we find the shell rudimentary in the slug, we meet with a conspicuous one in the common banded snail of the gardens (*Helix hortensis*); and if this testaceous mollusc, when it has protruded itself forth from its shell, be compared with the naked mollusc, or slug, their exact similarity in organization will at once be perceived. The above general description of the mollusca will apply to both the snail (*Helix*) and the slug, and will not be again repeated.

Those commencing the study of conchology, or shells, if they would pursue this branch of natural history scientifically, must aim at acquiring some knowledge of the animal which forms them.

To begin successfully they cannot do better than commence with that common, apparently naked, and simple mollusc, the slug (*Limax*). The best mode of observing its locomotive apparatus is to place one on a plate of glass, and whilst it is crawling over it, look at the movements made by the disc or foot, from the other side of the glass. With regard to the spiral form taken by the shells of the Helicidæ, from which in fact the name of the genus is derived (Gr. *helix*, a spiral line), it is owing to the great preponderance during growth of one side of the body over the other.

The beautiful variety of form, rainbow hues, and colouring of shells, has ever made this branch of natural science an attractive study. Besides, there is no difficulty in preserving shells, some of which, especially from the warm seas of the tropics, rival in their colouring the most ornamental of our garden flowers.

All the univalve shells of the conchologist belong to the order Gasteropoda; and the family Helicina, especially, which we have selected as illustrating the order, is a very large one, with numerous species, about 1,400 having been figured and described by naturalists. These have been distributed through all climates, particular species being restricted to each. All are vegetable feeders, and do an immense amount of mischief in the gardens. The best mode of restraining them is to take them from their hiding-places in winter, or destroy their eggs, which lie under the surface of the soil, looking like transparent peas. The thrush consumes vast numbers of garden snails bright and early in the morning, before the rest of the world is astir.

Onycha is the operculum of one of the Gasteropoda, the Strombus (Exod. xxx. 34): "And the Lord said unto Moses, Take unto thee sweet spices, stacte, onycha, and galbanum." The true operculum is to be distinguished from the temporary secretion with which the animal closes its shell whilst hybernating, and which is dissolved in the spring of the year, as in the Helicinæ, or land shells, as it is permanent, and formed of regular layers, deposited in a lateral, spiral, and concentric direction, around a

central point or nucleus. The operculum is attached to the foot, and the aperture remains always open, until the animal retires within its shell, or by contracting itself draws after it the operculum which closes its mouth. When burnt, onycha yields a perfume which is said to have greatly enhanced the odour of the perfumes with which it was mixed.

The snail is forbidden as food in Lev. xi. 30, and is mentioned in Ps. lviii. 8, "As a snail which melteth, let every one of them pass away." Now although it is true that the slimy track which the snail invariably leaves on the surface over which it has crawled is subtracted from the substance of its body, yet it is not true that the snail wastes away in consequence of the loss of this substance, which was most probably the view taken by the Psalmist, for the shell of the snail, which continues to grow through its life, receives its additional material annually from this secretion. In the authorised version the word snail is used in both these passages, yet the Hebrew words are different. That used in Lev. xi. 30, has already been referred to, as denoting a kind of lizard; that in Psalm lviii. 8, Dr. Tristram thinks refers to snails or slugs in warm climates, which were not sufficiently protected by the shade, are dried up, shrivelled, and wasted away by the heat of the sun, and he may be right. But whether this view or the previous one be correct, we repeat that snails form the substance of their shells with their rainbow hues and colours, from the colourless mucus which they leave in their track. How these natural chemists do this is indeed one of those problems which scientific men have yet to solve.

II. THE LAMELLIBRANCHIATA, OR PLATE-GILLED MOLLUSCS. Bivalve molluscs without a head (*Acephalous*), having their gills in the form of membranous plates. This order includes the cockle, mussel, scallop, oyster, etc.

PEARL OYSTER (*Meleagrina margaritifera*, L.).

If a shell is carefully examined, it will be seen in a moment that it has a rough outer surface, a medium layer, and a smooth,

polished, shining inner surface, called the nacre, white in the oyster, and beautifully iridescent in the mussel. The microscope shows this nacre to be a series of depositions, of nacreous matter, forming superimposed laminæ, or thin plates, varying in thickness in the different kinds of shell; and that where the laminæ are thick, a dull white appearance only is visible, as in the oyster, but where they are thin, and left by extremely delicate deposits, then the nacreous surface decomposes the light, and becomes beautifully iridescent. Sometimes the outer layers are rubbed off by natural causes, as in the case of shells which have been rolled on the beach



The Pearl-Oyster.

by the waves, and whose iridescent nacreous surface is more or less exposed but injured; generally, however, these rough outer layers are removed artificially, and the shell is polished. This nacreous layer is the well-known mother-of-pearl, so extensively used in the arts.

The pearl oyster (*Meleagrina margaritifera*, L.) appears to be subject to a disease caused by the introduction of foreign bodies into its shell, such as a grain of sand or some other solid substance, which forms a nucleus around which the oyster deposits the mother-

of-pearl. Pearls vary in size from that of small shot, which are called seed pearls, to that of peas and beans. Their value depends upon their size, purity, and lustre. The most valuable pearl fisheries are on the western coast of Ceylon and in the Gulf of Persia. Very large and beautiful pearls have been found recently in California.

Pearls were well known and much valued in Palestine in the time of Christ and His apostles. Our Lord referred to them in both His sermons and parables. Matt. vii. 6: "Give not that which is holy unto the dogs, neither cast ye your pearls before swine, lest they trample them under their feet, and turn again and rend you." Matt. xiii. 45, 46: "Again, the kingdom of heaven is like unto a merchant man, seeking goodly pearls: who, when he had found one pearl of great price, went and sold all that he had, and bought it." It is also evident from 1 Tim. ii. 9, that pearls were worn as ornaments of the person in apostolic times, and that the women of the first Christian churches were forbidden to use them. Besides the three passages already mentioned, the word pearl occurs in the New Testament in Rev. xvii. 4: "And the woman was arrayed in purple and scarlet colour, and decked with gold and precious stones and pearls." Rev. xviii. 12, 15, 16: "The merchandise of gold, and silver, and precious stones, and of pearls. The merchants of these things shall stand afar off weeping and wailing, and saying, Alas, alas, that great city that was clothed in fine linen and purple and scarlet, and decked with gold and precious stones and pearls!" (See also Rev. xxi. 21.)

The meaning of the words rendered pearls and rubies in the Old Testament is doubtful, but probably one of them signifies pearls. If the Authorised Version is right, mention is made of pearls once only in the Old Testament, viz., Job xxviii. 18: "No mention shall be made of coral or of pearls; for the price of wisdom is above rubies." If the word rendered rubies should rather be pearls, then besides Job xxviii. 18, there are five places in the Old Testament in which these gems are mentioned, viz., Prov. iii. 15: "She is more precious than rubies;" viii. 11, "For

wisdom is better than rubies ;" xx. 15, "There is gold and a multitude of rubies ; but the lips of knowledge are a precious jewel ;" xxxi. 10, "Her price is far above rubies ;" and Lam. iv. 7, "Her Nazarites were purer than snow, they were whiter than milk, they were more ruddy in body than rubies." In regard to the passage last quoted it must be remembered that there are pearls of a reddish tinge.

Before leaving this section we must refer to two words which may seem to have no connection with our subject, viz., *purple* and *blue*. The former word occurs about forty times in the Old Testament, and a word really the same is in Dan. v. 7, 16, 29, rendered scarlet. This is the purple dye from the Tyrian murex (perhaps a *crimson* colour). In Song of Sol. vii. 5, it is supposed by some that the comparison is not with the colour, but rather with the beautiful spiral shell of the fish. The word blue occurs in the Old Testament about fifty times, always as the representative of one Hebrew word, except in Esther i. 6, where the word rendered blue in the *latter* part of the verse really means *white marble*. This blue (probably a dark violet colour) was obtained from a shell-fish, most likely, a buccinum. The word crimson does not occur more than five times in the Old Testament, but the colour is really referred to very frequently, as the word rendered scarlet should rather be crimson. This dye is obtained from the cochineal insect (*Coccus cacti*), which is small, wrinkled, and of a deep mulberry colour. These insects are scraped from the plants into bags, killed with boiling water, and then dried in the sun. They are then of a silvery appearance, and yield, when rubbed to powder, a brilliant crimson.

CHAPTER II.

II. THE CLASS ARTICULATA, OR JOINTED ANIMALS.

ORDER I.—ARACHNIDA. SPIDERS AND SCORPIONS.



THE SPIDER (*Aranea domestica*). The repulsive appearance and unamiable character of this animal have created against it many unworthy prejudices, which a better knowledge of its habits would remove. Its frequent occurrence presents us with ample opportunities for observation. Whatever may be said about its ugliness, or the stealthy cunning by which it entraps its unwary victims, together with the ferocity and cruelty of its disposition, there is no denying that it possesses redeeming features. It is remarkable for patience, industry, and ingenuity. These virtues are daily exemplified in the common house-spider. Incapable of actively pursuing its prey, it is wholly dependent upon what chance conducts within its toils. It must therefore patiently await the approach of its victims, without stirring, excepting for the purpose of repairing any injuries to the net; which it does immediately without loss of time. These facts are too well known to be disputed. You may brush down the web of a spider as an unsightly nuisance in the corners of your room, but you cannot deny the ingenuity with which it is constructed, or the unwearied patience and exemplary industry of its occupant. As to the charge of cruelty and ferocity, the spider does not kill from wantonness, but from necessity. It must kill, or it must cease to live. Besides, considered aright, there cannot be any cruelty in any animal only exercising for its support those

bodily powers and that ingenuity with which it has been endowed by its Creator.

General Description of the Spider.—The Arachnida, or spiders, differ from insects generally in having no antennæ, or horns; their body is composed of two parts, instead of three; the head and thorax being united into a single mass called the cephalo-thorax, to which their legs, always eight in number, instead of six, as in insects, are attached. Their breathing organs combine the functions of lungs and gills, and they have a complete circulatory apparatus through which white blood flows. Spiders have six or eight simple eyes, called ocelli. Each eye is immovable, objects being only perceptible when placed directly before it; these eyes are, however, so situated as to make ample amends for their want of mobility, and give all the sight that is necessary. All the parts essential to a simple eye are found in them—viz., the cornea, crystalline lens, the vitreous body, and even the choroid, which last forms a black ring around the crystalline. Each of these ocelli is furnished with its own separate nervous filament. Spiders do not undergo any metamorphosis or change of form. They all envelop their eggs in a silken bag or cocoon.

The Instruments with which the Spider spins its Web.—These are little teat-like protuberances, called spinnerets, four or five in number, situated at the posterior extremity of the abdomen. The thread proceeds from a reservoir of glutinous fluid, which speedily hardens on exposure to the air. The extremity of each spinneret, highly magnified, shows minute perforations or orifices, about a thousand in number, through which the glutinous fluid is drawn into threads of extreme tenuity; and as there are five spinnerets, the spider's thread, small as it appears to our senses, must consist of 5,000 separate threads, which are rapidly coiled together into one by the delicate machinery of the spinnerets. This machinery is completely at the command of the spider, which has the power of enlarging or contracting the orifices at will. The exercise of this power may be noticed in a spider dropping from a height. The weight of its body is then suspended on its thread, and the

spider, by suddenly or gradually enlarging or contracting the apertures of the spinnerets, is able to descend rapidly, slowly, or to stop all at once at any point of its descent. The feet of the spider are furnished with three pectinated claws resembling hooked combs, through the teeth of which the thread proceeding from its spinnerets is drawn. The third claw, which is much smaller than the other two, and placed between them, is used by the insect in ascending, when it winds up with it the superfluous web into a ball.

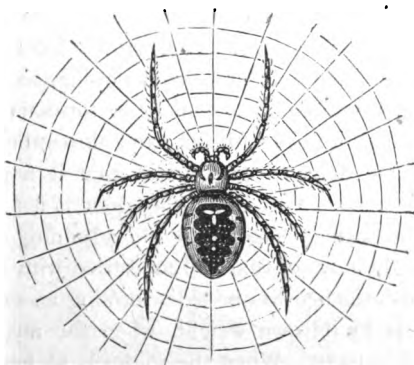
Let us now trace the proceedings of the common house spider in the construction of her net and the capture of her victims. Having carefully chosen the spot for the construction of her toils—commonly some shady recess in the corner of a room—she commences operations. She first presses her abdomen against the wall, so as to agglutinate her thread to its surface, and then walks across the wall to the opposite side, the resistance of the thread at its point of attachment drawing it out of the spinnerets at the same time. The thread is thus manufactured as it is required. Having arrived at the opposite side of the wall, the thread is drawn tight ; and it forms the outer margin or selvage of the web, and a support for all the other threads. It is therefore strengthened by being crossed with threads three or four times. From this margin threads are spun in various directions, until the whole fabric assumes the appearance of fine gauze. But the web is still incomplete. It is necessary that the spider should conceal her grim visage from the expected game. She therefore constructs a silken chamber, in the form of a sac, at the side of the web, with a mouth just small enough to admit her into the interior, which is roomy and convenient, and here she lies in ambuscade patiently waiting for her prey. Before finally taking up her position in this chamber, she connects it with every part of her web by means of threads, and should a fly or any other insect get caught, its struggles are immediately telegraphed to the spider by the vibrations communicated to these threads, which serve at the same time as a bridge over which she rapidly passes to secure her prey.

As soon as a fly or other insect is entangled in the toils of the

house spider, she darts down upon her prey, rapidly ties its legs and wings with threads, so as to prevent its struggles, gives it the fatal bite, and either hurries off with it to its place of concealment, or, if the insect be too heavy, sucks its juices in the place where it was captured, and then throws out the carcase. Sometimes the insect is so large as to be able to ward off the fatal stroke ; the spider in this case simply contents herself with securing her prisoner with additional threads, and then retires awhile from the contest, watching the insect from her silken chamber, until she perceives it to have become greatly enfeebled by its ineffectual struggles for life and liberty. She then returns, and soon finishes her victim and her dinner also, especially if she has had to wait a considerable time for it, and happens to be hungry. After her appetite has been satiated, she next mends her web, if injured, and retires again to her place of concealment. Sometimes, however, an insect such as a bee or a wasp, armed with a sting, to which the weapon which the spider uses is almost innocuous in comparison, gets entangled in the web. In this instance our spider neither attempts to seize nor to secure, but very wisely decides to let it alone, and will even assist its efforts to escape, by breaking off that part of the web in which it has become entangled, content to be rid of such a troublesome and dangerous intruder at any price. The house spider spins a close web, and is therefore called in science a tapestry weaver (*Tapitela*) ; but the common garden spider (*Epeira diadema*) spins an open net so beautifully regular in its structure, that most of our readers must have noticed it, fixed in a perpendicular, or more commonly an oblique position, generally in an opening between the plants, and attached to their foliage, especially in autumn, when the spider is especially active. This net is usually of a somewhat circular form, and hence its architect is classed in science under the division *Orbitela*, and is known as the geometric spider. The mode in which the garden spider constructs this very elegant geometric net is not very accurately known, as she generally works at night time. The following facts have, however, been ascertained. The construc-

tion of the marginal line or selvage of the net is the spider's first care ; this line is necessarily very irregular in outline, because it must be affixed to such leaves and twigs as are most suitable as points of attachment. Next the radii of the net are constructed, which stretch across it from its centre to its circumference. The circles in the centre are then formed ; afterwards the spiral ; and when this is finished, the spider immediately passes from the margin to the middle of the net, where she awaits her prey.

The different species of *Epeira* must be regarded as exceptions to the general rule as to the ugliness of spiders, for they are



Garden Spider (*Epeira diadema*).

remarkable for the richness, variety, and beauty of their colours. Of this they would seem to be conscious, as they do not hide like the house spider, but show themselves in the centre of their net. Much more might be said about the organization and habits of this very interesting class of insects. The bite of the tropical spiders is said to be very dangerous, and the nets of some of them (*Mygale*) are strong enough to capture humming-birds. The house and garden spiders spin webs to entrap their prey, and are sedentary in their habits (*Sedentes*) ; but there are spiders which spin no web, and have no settled habitation, taking their prey by

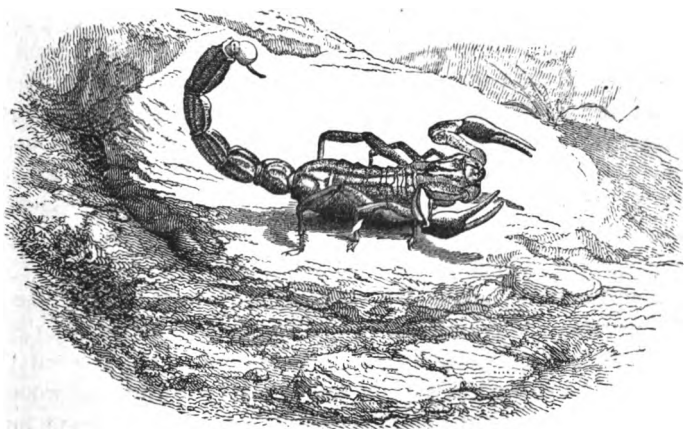
running it down or springing suddenly upon it. These are called hunting spiders. The silken thread possessed by these spiders is only used by them when they form the cocoon in which they enclose their eggs. Some species live upon trees (*Dolomedes*), upon the leaves of which they make a funnel-shaped silken nest; whilst others inhabit plants in the neighbourhood of water, on which they spread their filaments to entrap their prey (*Aquilela*), running over its surface with surprising rapidity, and even entering it without being wetted.

There is a very remarkable spider common in the South of France, the trap-door spider (*Mygale cæmentaria*), which constructs its habitation under ground; and for this reason it has been also called the mason spider. It usually selects a spot where there is a firm soil, free from grass, and sloping, so as to carry off the water; digs a subterranean gallery so tortuous that it is not easily traced, which it lines with silk; and closes the entrance with a circular movable door, so constructed that it fits the entrance to the gallery exactly. Externally, this door is flat and rough, so as hardly to be distinguished from the adjoining ground when closed; internally it is convex, and tapestried with silken threads which are firmly attached to one side, forming an excellent hinge. This door shuts by its own weight, when the mygale enters or passes out of its retreat. When the spider is at home to visitors, the door is kept slightly ajar, and raised on the approach of any insect, so as to admit its entrance; it is then immediately closed, and the prey secured. If an attempt is made to open the door from without, the mygale pulls at it strongly from the inside, so as to close it again, and, when foiled in her endeavours, she retreats, as a last resource, to the end of her tortuous gallery.

Reference is made to the spider in the book of Job (viii. 13-15): "So are the paths of all that forget God; and the hypocrite's hope shall perish; whose hope shall be cut off, and whose trust shall be a spider's web. He shall lean upon his house, but it shall not stand: he shall hold it fast, but it shall not endure." Here the professions of a hypocrite are well compared to the cunning snares of a spider,

which conceals its real designs from its victims : such professions are not to be trusted—frail and unreliable. But the passage seems to refer directly to the dependence of the hungry spider on its web, and the disappointment of the spider in the destruction of its toils and the loss of its hoped-for meal. A hypocrite does far more harm to a church than an open enemy. In the life and habits of the spider we have his character perfectly revealed, his picture photographed. See also Isaiah lix. 5, 6, where the wicked are said to “weave the spider’s web ;” and the object of that web, capture and death by violence, is alluded to in the words, “Their works are works of iniquity, and the act of violence is in their hands.”

Besides these two passages there is Prov. xxx. 28, “The spider taketh hold with her hands, and is in kings’ palaces.” Here, however, the original word is different, and really denotes some species of lizard.



The Scorpion (*Scorpio*).

THE SCORPION is an articulated animal belonging to the class Arachnida, or spiders. As with the spider, the body is composed

of two parts instead of three (as in the Insecta, or insects), the head and thorax being united into a single mass called the cephalo-thorax (Gr. *kephale*, the head, and *thorax*, the breast), to which are attached their eight legs and the organs of the mouth. They differ, however, from the spiders in the extraordinary enlargement of the palpi, which are large curved grasping organs resembling the claws of a lobster, and, like them, terminating in a pair of nippers or pincers; also in their abdomen, which in the spider is a soft rounded mass without any traces of segmentation, but in the scorpion is elongated so as to form towards its posterior portion a long six-jointed flexible tail, armed at its extremity with a sort of hooked claw. This tail, when the scorpion runs, is always carried over the back in a threatening attitude. The hooked claw at its extremity is the sting to which reference is so frequently made in the Bible. (See Rev. ix. 10.)

The eyes of scorpions are situated on the upper surface of the cephalo-thorax, and are of the kind called ocelli, or simple eyes. They vary in number from six to eight. Scorpions have four pairs of stigmata, or breathing pores or openings (Gr. *stigma*, a prick or puncture), placed on the under surface of the first four broad, anterior segments of the abdomen, which admit the air into small closed pulmonary sacs. These are easily seen with a small magnifying glass. In the specimen now on the table, which was taken by the writer near Pilatka, Florida, Jan. 26, 1867, and which is about an inch in length, the breathing pores are beautifully apparent when examined with a small flower lens.

The poison glands of the scorpion are situated at the base of the venomous claw or sting with which the tail terminates, ducts from these glands running towards its point, so that when the animal strikes, a portion of its venom is instilled into the wound. Scorpions inhabit the sub-tropical and tropical countries of both hemispheres, living on the ground, under stones, and hiding themselves under the bark of trees, always in shady, cool places. Their food consists chiefly of insects, which they seize with their pincers, kill with their sting, and then proceed to devour. Some

of the larger species in tropical countries capture lizards and other small animals, which they destroy in a similar manner. It is only the scorpions of tropical countries which are so dangerous to man. Their sting is in all cases extremely painful, although seldom fatal except in persons previously unhealthy. The sting is usually accompanied by much painful inflammation and swelling of the wounded part, and, not unfrequently, by vomiting and other distressing symptoms. The remedy is liquid ammonia applied to the wound and taken internally.

Scorpions, like spiders, exhibit the greatest care over their young, carrying them on their back for some days after they are hatched, and attending to them closely for about a month; after which they are able to take care of themselves.

In some Eastern countries scorpions are very numerous, and get into the interior of houses, where they will lie concealed under the carpets and furniture until their privacy is disturbed, when they are very apt to be irritated, and, unless destroyed, will attempt to strike and sting with their tail the person so offending. There are numerous references in the Bible to this habit of the scorpion in entering houses, its stinging those who tread upon or otherwise molest it, the inflammatory nature of its sting, and its great numbers. Deut. viii. 15: "Who led thee through that great and terrible wilderness, wherein were fiery serpents and scorpions." Ezek. ii. 6: "And thou, son of man, be not afraid of them, neither be afraid of their words, though briers and thorns be with thee, and thou dost dwell among scorpions." Luke x. 19: "Behold, I give unto you power to tread on serpents and scorpions, and over all the power of the enemy; and nothing shall by any means hurt you." Rev. ix. 5: "Their torment was as the torment of a scorpion when he striketh a man."

The word scorpion also occurs in 1 Kings xii. 11 and 14: "My father hath chastised you with whips, but I will chastise you with scorpions;" also in a similar passage, 2 Chron. x. 11 and 14. Some explain this phrase as meaning a scourge with iron points, but the expression is best understood as a figure of speech.

See also Luke xi. 12 : "Or if he shall ask an egg, will he offer him a scorpion?" and Rev. ix. 3 : "And there came out of the smoke locusts upon the earth; and unto them was given power, as the scorpions of the earth have power."

ORDER II. INSECTA. INSECTS.

THE HONEY BEE (*Apis mellifica*, L.).

This insect belongs to the order Hymenoptera (membrane-winged), or insects having four membranous wings, and an aculeus or sting. The natural history of the honey bee is in the highest degree interesting. It is a remarkable fact that we owe all our knowledge of its economy and habits to the labours and observations of a blind man, the elder Huber, who lost his sight when only seventeen years of age. He constructed glass hives, so that his wife could see all that was going on in them, and, through her faithful recital of what she saw, Huber was able to amass the material for his book.

The hive-bee is originally from the old continent, probably from Greece, but is now spread over the whole of Europe, Palestine, the North of Africa, and North and South America. Wild bees build in hollow trees, and in the clefts of rocks. They were common in Palestine, flying in great swarms, and the honey made by them was rich and abundant. Palestine is therefore called in the book of Exodus (iii. 8 and 17) "a land flowing with milk and honey." This was many years ago. But even to this day, in the mountainous parts of Judæa, as well as the hilly districts of other oriental countries, a prodigious quantity of wild honey is found. The hives for the most part are placed against the sides of rocks, and consist of a thin coating of clay rendered more durable by an inner lining of wax. Some of these hives, long erected, and exposed to the weather, are hardly distinguishable in colour and hardness from the rock to which they adhere, whilst the thin clay of others, of recent formation, is so fragile, that it is very apt to crumble in the hand, and mix with the liquid contents of the comb.

In the hives of the wild bees of greater age the honey, on the contrary, cannot be obtained unless the comb is cut with a knife. The hives of the wild bees are so abundant about the rocky caverns of Hindostan and the deserts of Asia and Africa, that all travellers who refer to them speak of them as one of the most striking features in the landscape of those countries. In the wilderness of Judæa especially, Maundrell saw them in the greatest abundance, in many places the smell of honey and wax being quite as strong as in the atmosphere of an apiary.

Throughout Europe the honey bee is now rarely found, except in a state of domestication in artificial hives. A swarm of bees consists generally of about 6,000 individuals, composed of three varieties of bees; viz., the workers, the drones, and the queen bee, which differ from each other, not only in organisation, but in the duties which they have to perform in the hive.



Neuter Bee, or
Worker.



Drone Bee.



Queen Bee.

The queen bee is so called because she appears to reign as sovereign over the community. The queen bee is the largest bee in the hive, and is distinguished by the length of her abdomen, which tapers to a point, the shortness of her wings, which cover only half her body, the superior brightness of her colours, and the curvature of her sting. The workers, or neuters, are the smallest; their antennæ have twelve joints, their abdomen is short, and furnished with a straight sting, their posterior feet have a brush for collecting pollen, and their femora, or thighs, a basket for its conveyance to the hive. These bees do all the work of the hive, collect the honey and pollen, construct the cells, and feed the

larvæ. The male bees, or drones, have no sting, their antennæ have three joints, and they simply attend to the queen bee, and when she is fertile, they are dragged forth and stung to death by the workers. This slaughter usually takes place in autumn.

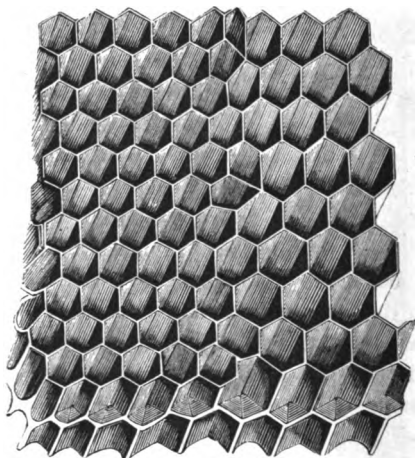


Wing of Drone Bee.



Hind Leg of Neuter Bee, or Worker.

The comb consists of beautiful hexagonal or six-side cells, which mathematicians tell us are constructed with the least possible

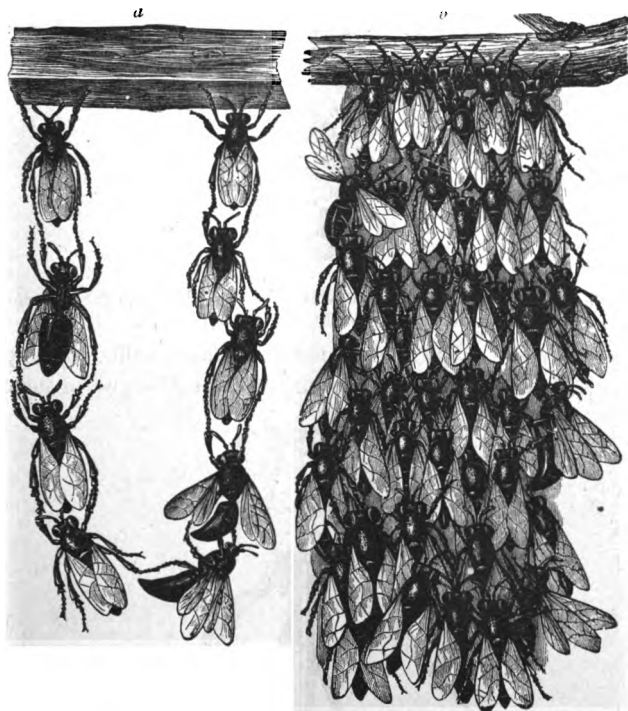


Hexagonal Cells of the Comb.

expenditure of material, and with perfect geometrical accuracy. In the construction of the combs the workers or neuters take hold of each other, and suspend themselves in clusters, forming festoons

or garlands which hang in all directions, and are immovable for twenty-four hours. During this time the wax is secreted in the form of thin plates beneath the abdomen.

One of the bees then makes its way to the roof of the hive, and, detaching its plates in succession, with the hind legs, works them



Clusters of Bees. *a*, Showing how they are formed. The first clings to the roof with his front legs, the second hooks himself on to the hind legs of the first, and so on. *b*, The complete cluster formed.

into the material forming the comb ; this bee is followed by others, and in this way a few cells are soon formed, and ultimately the comb itself is constructed.

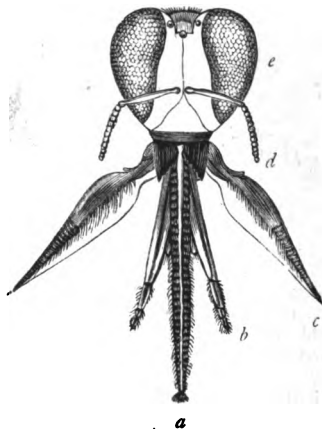
The bees collect the pollen by entering a flower, the anthers of

which are ripe and ruptured, and the pollen therefore exposed, which they brush off with their tarsal brushes, roll into pellets,



Bee magnified, showing plates of wax appearing between the segments of the under-side of the abdomen.

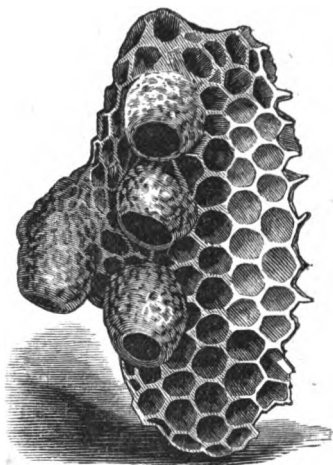
and place in the cavity of their femur, or thigh, called their pollen basket ; at the same time they unsheath their tongue, or suctorial



Head and Mouth of Bee. *a*, Ligula, or tongue; *b*, labial palpi, or feelers; *c*, maxillæ, or lower jaws; *d*, antennæ, horns, or feelers, attached to the head; *e*, compound eyes.

organ, and extract the honey from the nectary of the flower, which they transfer to their honey bag, and from thence, on their return to the hive, to some of the empty cells of the comb, which, when filled with honey, they close with wax, as a supply for the winter.

As soon as the queen bee begins to lay her eggs, which she does as soon as the cells are ready for them, she becomes an object of respect and attention to the whole hive. A guard of twelve workers constantly accompany her, who clear the way, feed her when exhausted, always approaching her with the greatest

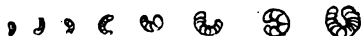


Royal Cells of the Comb, with Cells of Drones and Workers.

courtesy and humility, for this purpose, when she rests from her labours. She lays workers' eggs for about eleven months, stopping on the approach of winter, and resuming her work on the return of spring. At the end of eleven months she next deposits eggs which produce drones, and also those which develop queen bees. The sole employment of the queen bee consists in the laying of these eggs, and, as only one is placed in each cell, this occupies her almost incessantly.

The eggs destined to produce queen bees are deposited in what

are called royal cells once every three days, whilst the deposition of the drones' eggs is continued. The workers are divided into two sets, viz., those which collect the pollen and honey, and make the cells, and those which nurse the larvæ as soon as hatched from the egg. The eggs of the workers are the first hatched after deposition, in about five days, which produce little white maggots, or larvæ. These immediately open their mouths, and are fed by the nursing bees, for they are incapable of locomotion, or of providing food for themselves. In six days more each maggot fills up its cell, and spins a silken cocoon containing the chrysalis. The cell is now closed by the workers, and on the twenty-first day it emerges from the chrysalis a perfect bee, which immediately frees itself from its prison by gnawing itself through the cell wall. The drones emerge on the twenty-fifth day, and the queen bees on the sixteenth.



Development of Eggs into Larvæ.



Pupa.

When the first queen comes out of the chrysalis, it creates the greatest commotion in the hive; the old queen attempts to kill the new queen, but is prevented from doing so by the workers. The old queen, thus defeated in her object, in the midst of the tumult suddenly leaves the hive with every appearance of wrath, and is followed by the greatest number of workers and the drones or males. This is called the swarming of the bees. The queen and accompanying swarm generally fly to some neighbouring resting-place, are observed by the owner, captured, and placed in an empty hive, and a new colony is at once established, which recommence all the labours of which we have already spoken.

The swarm usually select the place of their future home, and when a great number have collected, forming a festoon, and ultimately a solid mass or clump of bees clinging to each other by their legs in the way already described, the queen makes her appearance, and attaches herself to the swarm.

Now is the time for the owner to take the swarm in a hive prepared beforehand to receive it. If this were not done, the cluster would fly off, establishing itself in some natural cavity, as the hollow of a tree, and the bees would return to a wild state. But this is never allowed. The swarm is generally followed and hived by the owner.



The Swarming of the Bees. *a*, Queen of the Swarm at its base.

The young queen whilst imprisoned utters a low complaining note which has been compared to singing, and is fed through a small hole made in the ceiling of the cell wall ; but as soon as the bees have swarmed and left the hive with the old queen, all danger being removed, the workers that remain free the new queens from confinement in succession, being careful to prevent any fighting between them for the sovereignty, so that they ultimately

leave the hive in succession with new swarms, which are watched by the owner until they alight, and hived as before. Each swarm consists of the recently hatched bees and a portion of the old inhabitants. After three or four swarms have left the hive, there are



Taking a Swarm.

not enough bees left to guard the royal cells. The young queens, therefore, necessarily escape two or three at a time. A battle ensues between them, and the strongest remains queen of the hive, after destroying all the royal larvæ and pupæ.

The fact has been mentioned that for eleven months the queen

bee does not lay any eggs destined to become queens. Sometimes evil befalls her ; she dies during that interval, despite all the care and attention bestowed upon her, and the hive is thus left without a queen. Her loss at once stops the labours of the hive ; the bees seem paralysed, and show every sign of mourning and distress for about two days. The state of anarchy then subsides, and another queen is provided in the following manner. Some of the workers go to the cells in which the eggs are deposited, and three of these cells are made into one. A single egg is allowed to remain in it, and the other two are destroyed. When this egg is hatched, the maggot is fed with a peculiar nourishing food called "royal bee bread," work being resumed over the whole hive, and going on briskly as before. The maggot fed purposely in this way on the sixteenth day produces another queen, whose appearance is hailed with every demonstration of delight, and who at once assumes sovereignty over the hive.

Wild bees have several enemies which devour their honey and combs, and from which they in some measure escape when under the protection of man. In the North of Africa and the South of Europe there is a tribe of beautiful birds called the *Meropidæ* (Lat. *merops*, a bee-eater), which feed on bees and wasps, catching them when abroad in search of honey, in company with swallows and other insectivorous birds. There is also a dipterous or two-winged insect, the *Bombylius* (Gr. *bombulios*, a buzzing fly), strikingly like a bee in appearance, which thus is enabled to gain access to the hive, unknown to the bees, where it deposits its eggs, the larvæ of which feed on the contents of the honey cells. Sometimes one colony of wild bees will attack another, and rob them of their honey, carrying it off to their own hive. When a colony is thus enfeebled by repeated attacks, and the queen happens to be killed, the bees will sometimes disperse, and the fugitives seek in vain for an asylum in another hive ; for their entrance is prevented on the threshold by its inmates, and they are at once stung to death, no bee being allowed for one moment in a hive where it was not born.

In Deut. i. 44, and Psalm cxviii. 12, allusion is made to the way in which bees attack their enemies, and their implacable fury when disturbed. In Deut. xxxii. 13, and Psalm lxxxi. 16, the nest of the wild bees in the rocks of Palestine, and the use of their honey as food, is referred to. The food of John the Baptist whilst in the wilderness was locusts and wild honey (Matt. iii. 4). See also Psalm xix. 10, where the sweetness of honey is mentioned, and Prov. xxv. 16, where temperance in eating it is recommended. Every reader will remember the narrative of Samson finding honey in the carcase of the lion which he had killed (Judges xiv.). Occasionally honey denotes a syrup made by boiling down the juice of grapes (Gen. xliii. 11, Ezek. xxvii. 17).

THE HORNET (*Vespa crabro*), a severely stinging hymenopterous insect closely allied to the wasp, is referred to in Exod. xxiii. 28, Deut. vii. 20, Josh. xxiv. 12.

THE ANT (*Formica rufa*).

"Go to the ant, thou sluggard; consider her ways, and be wise" (Prov. vi. 6). The ant belongs to the natural order Hymenoptera, or membrane-winged insects (Gr. *hymen*, a membrane, and *pteron*, a wing), which includes also the wasp and the bee—insects congregating together into large and well-regulated communities, and displaying in the highest degree intelligence and skill. Hence ants, wasps, and bees have in all ages attracted a considerable share of attention, and deservedly so, as the social habits of these insects are most interesting and well worthy of study.

Everybody knows that bees and wasps have individually four veined membranous wings; and it seems at first strange that naturalists should have classed ants along with them—those little busy wingless creatures, which we see so frequently foraging about in our fields and gardens with such ceaseless activity. But if an ant's nest be examined towards the end of the month of August, numbers of them will then be found in a winged state. They are the young ants, both male and female, just liberated from the cocoon. At a certain stage of their life, therefore, these ants are

winged, and the difficulty disappears. But a still better reason can be given for this classification, in the fact that ants, like bees, form a well-regulated republic composed of three distinct kinds of individuals—males, females, and neuters, or workers. The males and females are winged, the former during the whole, and the latter through only a brief portion of their existence; the neuters are never winged.



Mining Ants (*Formica cunicularia*). *a*, Male. *b*, Worker. *c*, Female.

The workers, or neuters as they are called, form the great bulk of the community. They take charge of the eggs, feed and rear the larvæ, assist them out of the chrysalis, build and defend the nests, doing in fact all the work of the household.

The nests of ants, popularly known as ant-hills, are constructed in different styles of architecture, and according to plans which vary with the species.

The nest of the wood-ant (*Formica rufa*, L.), is a very common species in this country and in Germany. These ants construct a little rounded hillock, composed of fragments of all kinds of objects—pieces of wood, bits of straw, fragments of leaves, small stones, etc., apparently heaped together promiscuously; but the hillock itself is in reality a most ingenious device for evading the effects of wind and rain, and preventing the attacks of enemies, and especially for husbanding the heat of the sun. The height of the nest is usually about fifteen inches above the ground, and it descends to a corresponding amount of depth, the earth and rubbish from below serving to construct the upper portion of the edifice. In outline it presents the appearance of a dome. The interior is excavated into numerous chambers for the reception of

the eggs, larvæ, and pupæ; these chambers communicate with each other by means of galleries, some of the latter leading to certain openings in the exterior walls of the nest, used as entrances by the ants. The walls and roofs of these galleries and chambers are consolidated and rendered water-tight by the ants, who employ for this purpose the pellets of earth previously excavated, which have been tempered with rain-water, and hardened in the sun.

"I never found," says Francis Huber—who has done as much for ants as Peter Huber, his father, has done for bees—"even after long and violent rains, the interior of the nest wetted to more than a quarter of an inch from the surface, provided it had not been previously out of repair, or deserted by its inhabitants."

The number of these chambers and galleries depends upon the population and extent of the nest, but they all terminate in the largest chamber, which is nearly in the centre of the building, much loftier than the rest, and usually occupied by the workers and females.

The daily routine of life amongst the workers may be thus generally described. As soon as the ants domiciled near the exterior of the nest become conscious of the warmth of the morning sun, they run along the galleries into the several chambers, communicating their knowledge to every ant they meet, by tapping them gently with their antennæ, and if this fails to rouse them, biting them severely with their mandibles. Soon all are up, and the entire nest presents a scene of the busiest activity. The workers first remove the little bits of wood and dried leaves with which the several entrances to the nest are closed every night, or on the appearance of rain or damp weather, and distribute them on its outside surface. The day's duties then commence in earnest. Some of the ants carry on the work of excavation; and the little miners may be seen bringing out their pellets of mould, and laboriously placing them at a distance from the entrance; others pick up the eggs which the female ants have laid during the night, and take them to their appropriate chambers, or carry up the larvæ out of the ant-hill, and place them in situations

where they are exposed directly to the sun ; the same ants take them back into the nest after this exposure, which is done daily, the weather permitting. The larvæ make their appearance within a fortnight after the eggs are laid ; and the workers, besides exposing them to the sun, feed them, and keep them perfectly white and clean. On rainy days the entrances to the nest remain closed, the ants remaining inside ; they also go into the nest for shelter on the approach of rain, hastily carrying the larvæ down with them, reappearing, however, on the outside as soon as the shower is over. When the sun goes down, the day's work ceases, and they re-enter the nest, which is carefully closed and barricaded for the night, so as to render either the entrance of an enemy or a single drop of rain impossible.

But there are other ant-labours worthy of notice. After the larvæ have spun their silky cocoon and become pupæ, feeding excepted, they have the usual amount of attention bestowed on them, being daily exposed to the sun as before, and then carried back into the ant-hill. Even the extraction of the ants from the cocoon is the business of the workers. The perfect insect is too weak to effect its escape without their aid. Three or four of them therefore mount on the cocoon, when the time has arrived, and carefully cut its threads, near the point where the head lies ; an opening is thus formed, which allows the prisoner to escape. They then watch over the new-born ants, both male and female, helping them to stretch out their wings, feeding them with the greatest care, and teaching them how to thread the paths and windings of the common dwelling. The joyful epoch at last arrives for the winged ants to take their flight, and the workers appear to be most tenderly solicitous about their welfare even up to the last moment, accompanying them to the summit of the highest herbs, feeding and caressing them for the last time ; and when they rise in the air and disappear, seeming to linger over those whom they have watched so carefully, and will never see again.

The females return to the ant-hill ; and as they no longer

require wings, are deprived of them by the workers, or which oftenest happens, they themselves tear them off. With the loss of their wings they lose their desire for liberty, the cares of their approaching maternity now occupying all their attention. The working ants show these pregnant females, the future hope of the community, every attention. They caress, brush, and lick them, and offer them food. They take possession of them on the appearance of danger, and transfer their precious persons to a place of safety. The workers' task is immense. But then there is a division of labour and good understanding among them, the ants being bound together by mutual affections.

The utmost peace and harmony pervades amongst the different members of these co-operative communities, and the Utopian dream of human unity and concord—indulged in by some philosophers, who would have a community of goods, notwithstanding the *instinct of private property*, and revolutionize society by making it co-operative instead of competitive—would seem among ants to have been practically realized. Notwithstanding the immense amount of labour devolving upon the workers, the best understanding evidently exists among them, as they are always ready to assist each other when in difficulty or in trouble, and share with their neighbour any food which they possess. If an ant is tired, a comrade will carry the wearied one; if wounded, the first ant the sufferer meets renders it the necessary assistance. When an ant has discovered a very rich prey, he never thinks of enjoying it privately like a selfish gourmand, but makes the fact publicly known, inviting all his companions to the feast. The female ants, too, of which there are always a number in the ant-hill, live together in the most perfect harmony; very unlike the females of the hive-bee, who admit of no equality amongst themselves, attacking each other with the greatest fury, until only one remains queen and mistress of the hive.

But however sociable the ants of the same ant-hill are among themselves, it is very certain that they do not cherish these kindly feelings to their neighbours of a different species. "I have wit-

nessed," says Huber, "the inhabitants of two large ant-hills engaged in a spirited combat. Two empires could not have brought into the field a more numerous or determined body of combatants." So far as is at present known, the cause of these wars is an attempt on the part of one species to capture the workers of another species, whilst in the pupa condition, and use them as slaves for the benefit of their own community as soon as they emerge from the chrysalis. The rufous wood-ant obtains workers in this way; and it is a very remarkable and curious fact that it always attacks for this purpose, and invariably with success, the nest of a black ant called by naturalists, for this reason, the negro ant.

The ants which issue forth on these marauding expeditions, which are larger and differently formed from the others, have been called soldier ants. First scouts are sent out, who return and report the exact position of the nest of the negro ants, afterwards acting as guides of the invading army, which marches in a body to the attack. On the approach of this army into their vicinity, the black ants on guard speedily communicate the alarm, and the inhabitants of the nest rush out by thousands; a desperate conflict now ensues, always ending in the defeat of the negroes. The red ants now tear open the sides of the negro ant-hill with their powerful mandibles, and are soon seen issuing from its innermost chambers and galleries with the captured pupæ, obtained despite the vigilance and valour of their natural guardians. The red ants then return in perfect order to their nests, bearing with them their living burdens. Arrived at home, the pupæ are treated with the same care and kindness as their own; and when the black ants emerge from the chrysalis, they, curiously enough, repair the nest, feed the larvæ, take them out into the sunshine, and perform all the other duties of red working ants with the greatest apparent energy and good will!

All our European ants are decidedly carnivorous in their habits, although they evince a decided predilection for saccharine juices. The honey-dew, found on the leaves of plants in summer, is now ascertained to be deposited by aphides, or plant lice. The ants are

passionately fond of it, and know how to milk the aphides—patting their abdomen first on one side and then on the other with their antennæ, until a drop of the coveted fluid is exuded, which they eagerly drink. Strange as it may seem, yet it is no less true than strange, that the ants shut up aphides in apartments constructed specially for their comfort, tending and feeding them as we do milch cattle; or the aphides on the branches of a tree or the stalks of a plant may be thus appropriated; and should intruders in any case appear, anger is manifested. It is even said that the possession of a flock of aphides is not only a subject of discord, but becomes sometimes a *casus belli* between two neighbouring ant-hills.

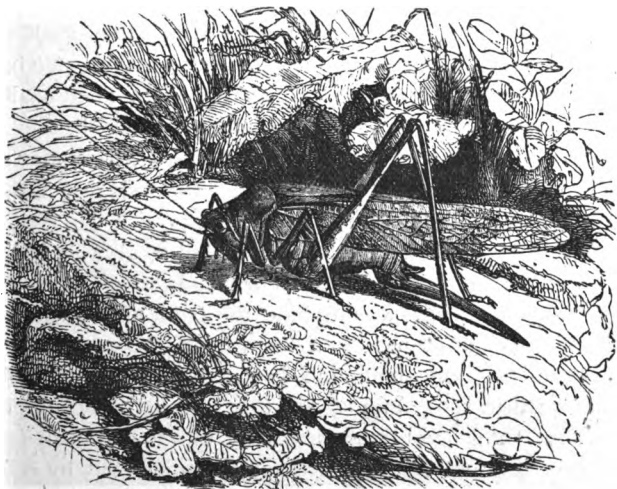
Besides Prov. vi. 6, this insect is referred to in Prov. xxx. 25: "The ants are a people not strong, yet they prepare their meat in the summer." From time immemorial the ant has been regarded as the type of industry and providence, the idea having probably arisen from their having been seen, as is often the case, carrying the cocoons in their mouths. These, by a superficial observer, might easily be mistaken for small grains of corn. Colonel Sykes, however, observed an ant in India which laid up a large store of grass seeds; and it is possible that other species in warm climates may have the same habit, one of which may have been in Solomon's eye when he penned his well-known advice to the sluggard.

THE MIGRATORY LOCUST (*Locusta migratoria*).

The locust belongs to that division of insects known to entomologists as Saltatorial, or Leaping Orthoptera (Greek, *orthos*, straight, and *pteron*, a wing), so called in allusion to the wings, which are longitudinally folded when at rest. The locust is closely allied to the cricket and grasshopper, which belong to the same class of leaping insects, having for this purpose the hinder legs, and especially the thighs, of very large size and strength.

There are no insects more dreaded by the inhabitants of warm climates than locusts, who fear an invasion of them far more than that of an hostile army, on account of their voracity. Eastern

countries, and especially those in the neighbourhood of the Levant, appear to be the most exposed to the attacks of these destructive insects, and hence we find many highly poetical references to them in the Scriptures, in which the hosts of the locusts are compared to the avenging armies of the Deity. In the book of the prophet Joel this is the view that is taken. In modern times the Arabs look upon them in this light : in fact, their learned men declare that the locust bears a statement to this



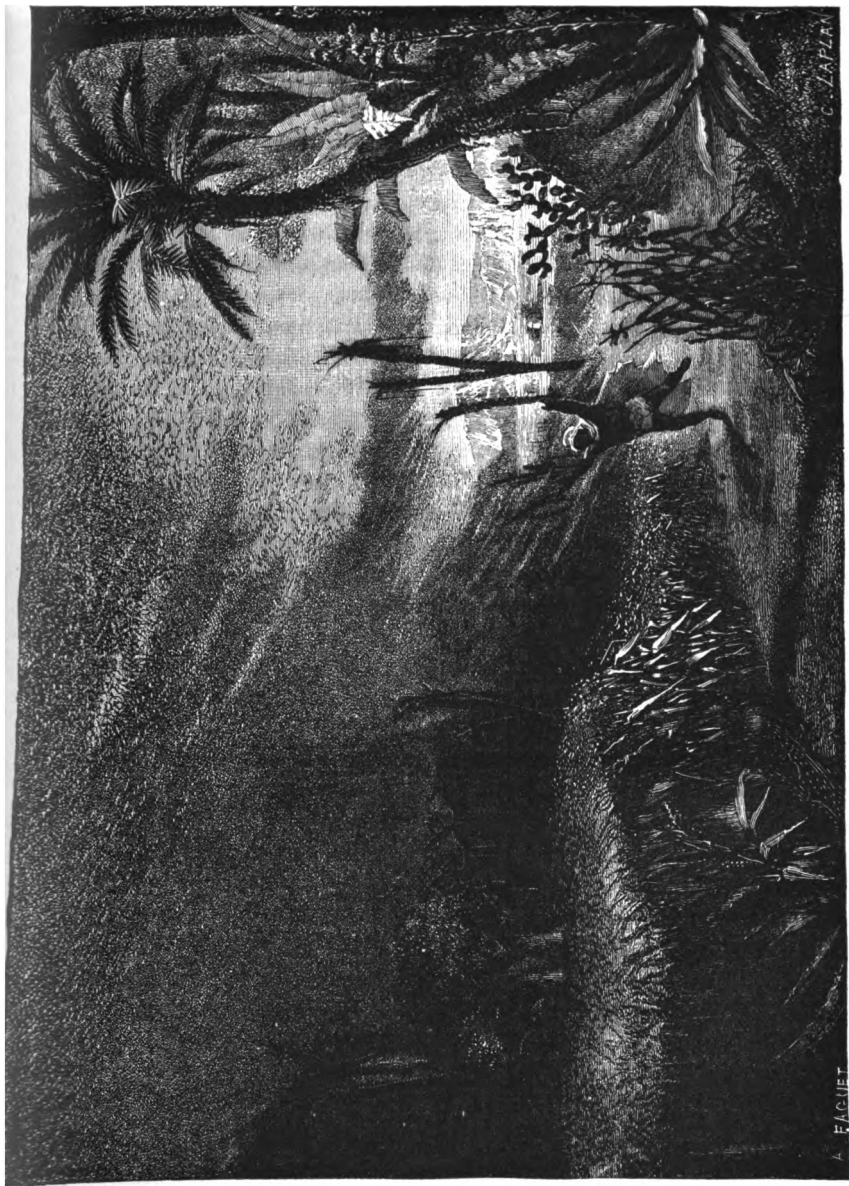
The Migratory Locust.

effect, in good Arabic, on its wings ! They fly in countless multitudes, and immediately, on alighting, commence devouring the vegetation of the country, only leaving the devoted spot when they have stripped it of everything green. The ground appears, in fact, as if its vegetation had been burnt with fire. This appearance of burning is expressly referred to in the Scriptures (see Joel ii. 2-7, 9, 10), where the description of the habits of the locust is most remarkable, both for its grandeur and fidelity to nature : "A day of darkness and of gloominess, a day of

clouds and of thick darkness, as the morning spread upon the mountains: a great people and a strong. . . . The land is as the garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them. The appearance of them is as the appearance of horses; and as horsemen, so shall they run. Like the noise of chariots on the tops of mountains shall they leap, like the noise of a flame of fire that devoureth the stubble, as a strong people set in battle array. Before their face the people shall be much pained; all faces shall gather blackness. They shall run like mighty men; they shall climb the wall like men of war; and they shall march every one on his ways, and they shall not break their ranks. . . . They shall run to and fro in the city; they shall run upon the wall, they shall climb up upon the houses; they shall enter in at the windows like a thief. . . . The sun and the moon shall be dark, and the stars shall withdraw their shining."

The quantity of these insects is incredible to all who have not seen them. They fly in vast swarms or clouds, which are so dense as to darken the heavens, and hide the light of the sun. The height of the cloud depends on the state of the weather. On a fine day it is usually about 200 feet above the ground, but in gloomy weather, sometimes so low that travellers, encountering a swarm, are compelled to turn their back till the current is passed, to protect the face from the painful blows inflicted by collision with the bodies of these insects. A cloud of locusts overspreads the country for miles, and as soon as it alights, then the work of destruction commences. The noise they make in browsing may be heard at a considerable distance, and resembles the fearful roaring of a devouring fire driven by the wind. In fact, fire itself eats not half so fast—"nothing escapes them," nor is there a vestige of vegetation to be found, when they take to flight, and go elsewhere to produce similar disasters. "Before them" the country "is as the garden of Eden;" "behind them, a desolate wilderness."

On the approach of a swarm of locusts, every effort is made to



A Cloud of Locusts in Algeria.

the inhabitants of the country thus threatened to prevent it from settling on their grounds. Loud shouts are raised by the people, and every available weapon employed in beating down the swarm. In Southern Russia, "whoever first sees a cloud of locusts approaching is bound to raise an immediate alarm, and to give the earliest possible information to the Schultz, who immediately orders out the whole village; and every man, woman, and child comes forth armed with bells, tin kettles, guns, pistols, drums, flails, whips, and whatever other noisy instruments they can lay their hands on. A frightful din is then raised, which often has the effect of scaring away the swarm, and inducing it to favour some quieter neighbourhood with its presence." *

There are several species of these insects, but the one best known is the migratory locust (*Locusta migratoria*), which measures about two inches and a half in length. This species is greenish, with dirty-grey elytra, or wing covers, whitish wings, and pink legs. Others are much larger, as the crested locust (*Locusta cristata*), a beautiful species common in the Levant, four inches long and between seven and eight inches in expanse of wings.

It is difficult to estimate the number of locusts in one of these swarms. A naturalist in Germany roughly estimated one which covered four square miles of ground at 92 billions and 160 millions of individuals. This is a very moderate calculation, for they are often piled knee deep upon the earth. When a swarm alights, if there happen to be a tree near the place, it seems almost ready to break down under the sudden load; while the crackling of the branches, the tearing of the bark, and the rustling of the wings, raises a din quite as loud as that of a carpenter's shop in which a score or two of men are sawing, boring, and planing. Nothing impedes their progress, for they almost invariably, when they have alighted, proceed in a straight line. Fires are everywhere kindled by the people about their grounds, but the mere weight of the general mass forces the foremost ranks into the flames in such immense numbers as to extinguish them. Artificial trenches

* Kohl's "Russia."

are cut across their line of march, and filled with water or natural streams, and rivers are encountered; but the vast hosts which form the van march boldly forward into them, and with their dead bodies form a bridge over which their more fortunate companions pass. The terror of a village or town thus invaded can be imagined, but cannot be described—locusts, two inches and a half, and four inches in length, descending from the atmosphere, innumerable in number as the flakes of snow in a snow storm. The roofs of the houses are covered, and the streets, to the depth of several inches, become one mass of crawling, crackling, hissing, buzzing vermin. Every aperture of the house is carefully closed, yet they come down the chimney by thousands, and beat against the windows like hail.

The excrement which a swarm of locusts leaves behind after it has taken to flight is enormous, and so injurious to the soil that, for a long time after a field has been left by them, the cattle manifest the greatest aversion to the place. .

“If the sea be near at hand, it is thought to be a great point gained if the locusts can be driven into the water, into which they fall in such enormous masses that their bodies form at last little floating islands, upon which the others establish themselves to the height of 20 or 30 inches. If the wind is blowing strongly from the shore, these locust islands are driven out to sea, and the insects perish; but if the flow of air seaward is gentle, the locusts soon work their way back to the land, where, having dried their wings, they again recommence their depredations. The millions, meanwhile, that have found a watery grave, give a blackened hue to the foam of the breakers, and lie scattered along the coasts in long lines that look like huge masses of seaweed thrown up by the waves.”* A dreadful effluvium arises from their dead bodies, which spreads through the atmosphere for many miles inland. To this the Prophet Joel refers (ii. 18-20), “Then will the Lord be jealous for His land, and pity His people. Yea, the Lord will answer and say unto his people, Behold, . . . I will remove far off from

* Kohl’s “Russia.”

you the northern army, and will drive him into a land barren and desolate, with his face toward the east sea, and his hinder part toward the utmost sea, and his stink shall come up, and his ill savour shall come up, because he hath done great things."

The inhabitants both of Asia and Africa, where locusts particularly abound, use these animals as a common article of food; and the "meat" of John the Baptist, we are told (Matt. iii. 4), was "locusts and wild honey." Their legs and wings are removed, and their bodies fried in oil or butter. Locusts are also dried, pounded, and used as flour. With this last object in view, they are caught about day dawn, or before the sun has risen sufficiently to impart animation to them. They are first swept from the branches, where they hang in clusters, into sacks, and carried in them on the backs of camels. During the transit the living cargo makes a great buzzing inside the sacks. On arriving at the place, they are dried and reduced to meal, which is not very palatable at first to Europeans; but the taste for this sort of diet can be acquired. Dr. Livingstone speaks quite highly of locusts as an article of food, thinking them superior to shrimps. Locusts also furnish, in abundance, nutritious food for birds, oxen, camels, antelopes, and elephants.

Locusts are always to be found in Algeria, but they never commit such terrible havoc there as they do in other countries. A disastrous invasion of locusts, however, took place in 1866, in the month of April. Passing through the mountain gorges and valley into the fertile plains near the coast, they alighted first on the plain of Mitidja, and on the Sahel of Algiers. The mass, at certain points, intercepted the light of the sun, and resembled those whirlwinds of snow which, during the winter, hide the nearest objects from our view. Very soon the cabbages, the oats, the barley, the late wheat, and the market gardeners' plants were partly destroyed. In some places the locusts penetrated into the interior of the houses. "By order of the Government of Algiers, the troops joined the colonists in combating the plague, and the Arabs, when they found their interests suffering, rose to lend their aid against

the common enemy. At the close of the year the French Government opened a subscription to alleviate as much as possible the ruin which was thus brought upon the colony." *

Five Hebrew words are rendered locust in the Bible, and as four others must be considered in connection with them, nine different Hebrew words are translated by the words locust, bald locust, beetle, grasshopper, caterpillar, cankerworm, palmerworm.

The most common of these words, which first occurs in connection with the plague of locusts (Exod. x.), is found in Lev. xi. 22, and in twenty-three other places in the Old Testament. It is always rendered *locust*, except in Judges vi. 5, vii. 12, Job xxxix. 20, Jer. xlv. 23, where we have *grasshopper*. No doubt this is the migratory locust (*Locusta migratoria*).

The second and third words are rendered bald locust and beetle in Lev. xi. 22, and occur nowhere else.

The fourth word, translated grasshopper in Lev. xi. 22, occurs five times in the Old Testament; viz., Lev. xi. 22, Num. xiii. 33, 2 Chron. vii. 13, Eccles. xii. 5, Isa. xl. 22. Once only is it rendered locust, in 2 Chron. vii. 13.

All that can be said about these three words is, that each denotes some species of locust (the last some species of small size, apparently). Our earliest English version of the Pentateuch gave the words in their original form, so doubtful did their meaning appear.

A fifth word occurs in Isa. xxxiii. 4, which is rendered locust, and in Amos vii. 1, Nahum iii. 17 (grasshopper). Here also it is impossible to say what species of locust is meant.

The sixth Hebrew word is rendered caterpillar in 1 Kings viii. 37, 2 Chron. vi. 28, Ps. lxxviii. 46, Isa. xxxiii. 4, Joel i. 4, ii. 25.

The seventh word is three times translated caterpillar, as in Ps. cv. 34, Jer. li. 14, 27, and six times cankerworm, Joel i. 4 (twice), ii. 25, Nah. iii. 15 (twice), 16. This word and the last not improbably denote the locust in the larva state.

The eighth word is rendered palmerworm, Joel i. 4, ii. 25, and

* "The Insect World." By Louis Figuier, p. 307.

Amos iv. 9, and probably means a caterpillar. It seems to be used in as vague a sense as the English word.

The ninth word occurs once only, in Deut. xxviii. 42, and is translated locust, but may not be a locust at all, but some destructive insect, as the African tsetse (*Glossina morsitans*), or the poison-fly of Africa. This fly is somewhat less than the common blue-fly that settles on meat, yet its bite carries with it a poison equal to that of the most deadly reptile. It is closely allied to the gadfly (*Tabanus bovinus*) of this country.

DIPTERA.

The dipterous order of insects, or two-winged flies, having a mouth formed for suction, are referred to in the Scriptures. Some of them, as the African and English gadfly, are a great torment to cattle, and capable of inflicting a very painful wound with their ovipositor, causing them to become wild and furious, and gad or stray from the pastures, and hence the origin of the ancient term of gadfly. Others, as the well-known gnat and mosquito, are the most inveterate blood-suckers that ever tormented man and beast.

The term fly in the Bible is represented by two Hebrew words.

1. Exod. viii. 21, 22, 24, 29, 31, where the verses refer to the miraculous swarms of flies which were brought upon Pharaoh and the Egyptians, as indicative of God's anger. Ps. lxxviii. 45, cv. 31, where the fact of this plague of flies is again mentioned. There are different opinions, but probably our version is right in the translation flies.

2. Eccles. x. 1: "Dead flies cause the ointment of the apothecary to send forth a stinking savour; so doth a little folly him that is in reputation for wisdom and honour." Isa. vii. 18: "And it shall come to pass in that day that the Lord shall hiss for the fly that is in the uttermost part of the rivers of Egypt." Probably this fly was the "*dthebab*," something like a gadfly.

Gnat occurs once in the New Testament: "which strain at," or as it should be, "which strain out a gnat, and swallow a camel" (Matt. xxiii. 24).

LEPIDOPTERA.

The lepidopterous order of insects (Greek, *lepis*, a scale, and *ptera*, wings), or scale-wings, having four wings covered with coloured, farinaceous, microscopic scales, resembling the most delicate feathers, are represented only in the Scriptures by the sub-order of moths. These are readily distinguished from the other sub-order of butterflies by the following easily recognised characteristics. The antennæ of a butterfly are club-shaped or knobbed at the end, those of a moth are thread-form, frequently plumose, or feathery; they resemble the teeth of a comb. The butterfly is awake and active by day, and sleeps at night, its wings being then folded together, and in the vertical position; but the moth is awake and active only in the twilight hour or at night, and is asleep by day, its wings in repose being spread out horizontally. Again, a butterfly is nipped in at the waist, making the division into head, thorax, and abdomen very distinct, but there is no such distinct division in a moth.

I can only add most briefly that both in butterfly and moth life there are four different stages; viz., the egg, caterpillar, chrysalis, and imago, or perfected insect, in which both male and female are reproduced. For example, the female of the magpie moth (*Abraxas grossularia*) lays her eggs upon the leaves of the gooseberry bush, upon which the caterpillars feed as soon as they emerge from the egg. After changing its skin several times, the caterpillar becomes a chrysalis, or pupa, which may be readily found upon the same gooseberry shrub. The pupa in a few weeks' time emerges the imago, or perfected insect.

The Latin word pupa, a baby, well describes this condition, for if the pupa be carefully opened, the imago or perfect insect will be found there, with the wings, but small and undeveloped, looking very much like an infant wrapped in swaddling clothes. Out of the pupa, or chrysalis, emerges in a few days the imago, or perfect insect, the white and black spotted moth, which may be found in abundance in the garden, flying about the gooseberry bush, and

called for that reason the magpie moth, which is the last stage of transformation. This lays its eggs, as its ancestors did before it, on the food-plant selected by the species, which again pass through the same ever-recurring cycle of vital change. The words of Ecclesiastes, or the Preacher, are truly applicable to these insect changes : "The thing that hath been, it is that which shall be; and that which is done is that which shall be done : and there is no new thing under the sun. Is there anything of which it may be said, See, this is new? it hath been already of old time, which was before us" (Eccles. i. 9, 10).

The moth is mentioned in the following places in the Bible :—

Job iv. 19 : "How much less in them which dwell in houses of clay, whose foundation is the dust, which are crushed before the moth?" (meaning probably "like the moth;") xiii. 28 : "And he, as a rotten thing, consumeth, as a garment that is moth-eaten." Here the clothes-moth is evidently alluded to (*Tinea pellionella*). xxvii. 18 : "He buildeth his house as a moth, and as a booth that the keeper maketh." Here the chrysalis, or pupa, of the moth is plainly referred to. Ps. xxxix. 11 : "When Thou with rebukes dost correct man for iniquity, Thou makest his beauty to consume away like a moth : surely every man is vanity." How well does natural history help us to appreciate the truth and pathos of this passage! The beauty of man, both mental and bodily, how soon it wastes away and perishes like the beauty of a moth! And these insects are certainly unrivalled in beauty, especially if examined with a microscope; in fact, their beauty is evident enough even to the eye unassisted, some of them vieing with the snow-flake in the purity of their vesture, whilst others exhibit the most gorgeous metallic hues. Isa. l. 9 : "Lo, they all shall wax old as a garment; the moth shall eat them up." Also Isa. li. 8 : "For the moth shall eat them up like a garment, and the worm shall eat them like wool." In both these passages the destructive habits of the clothes moth insect are referred to. Hosea v. 12 : "Therefore will I be unto Ephraim as a moth, and to the house of Judah as rottenness."

As soon as the caterpillar of the clothes moth quits the egg, it begins to form a nest. For this purpose, having spun a thin coating of silk round its body, it cuts filaments of wool or fur close to the thread of the cloth, and applies the pieces to the outside of its case, which covering it never leaves, putting out its head at either end of the case to feed, as may be most convenient. When, from the increase in its size, the case becomes too small, it makes an addition to it at each end. After changing into a chrysalis in April or May, it remains quiescent for about three weeks, when a small nocturnal moth of a silvery-grey colour comes forth.

APTERA.

To the apterous order of insects, or insects without wings, there are but few references in Scripture, and the insects are too well known to require description. The flea (*Pulex irritans*) occurs in 1 Sam. xxiv. 14: "After whom is the king of Israel come out? After whom dost thou pursue? after a dead dog, after a flea,"—the language of remonstrance used by David to Saul. See also 1 Sam. xxvi. 20: "For the king of Israel is come out to seek a flea, as when one doth hunt a partridge in the mountains."

Lice are only mentioned in connection with one of the Egyptian plagues (Exod. viii. 16, 17, 18, and Ps. cv. 31). Many have believed that this was rather a plague of gnats (mosquitoes), but the ordinary translation is probably correct.

ORDER III.—ANNELIDA, OR RINGED ANIMALS.

THE HORSE LEECH (*Hirudo medicinalis*).

The body of this animal is cylindrical, composed of a number of little rings, and provided with a circular disc at either extremity. These discs constitute their chief means of obtaining food, besides aiding them greatly in locomotion. The leech lives by sucking the blood of other animals, and for this purpose its sucking apparatus, the discs at the extremities of its body, are furnished with three triangular horny teeth, having a sharply serrated edge (Lat.

serra, a saw), and disposed in such a manner that their junction forms the three radii of a circle, which explains the peculiar appearance which their bite leaves on the skin. The leech having secured a hold, the blood is pumped up from the wound, and flows freely. Leeches swim readily in the waters of pools and marshes, where they are usually found, and their capture effected by men who wade in with naked legs, to which the leeches adhere; the men leaving the water and removing them before their bites become dangerous. Their use in medicine is well known. We have them in England, but we import the greater part of those in use from the continent.

The two suckorial discs of the horse leech are perhaps referred to in Prov. xxx. 15: "The horse leech hath two daughters, crying, Give, give."



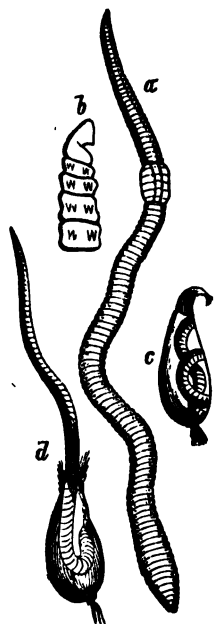
The Horse Leech.

THE COMMON EARTH WORM (*Lumbricus terrestris*) is without suckorial discs, but the rings of which it is composed are furnished with minute bristles or hooks, which give it a firm hold on the ground and aid it in locomotion, whilst its pointed head penetrates it like a wedge; indeed, strictly speaking, they possess no distinct head, and are quite destitute of eyes.

Worms may do some damage to vegetation by devouring the roots of plants, but they do more good than harm; by loosening the soil, and giving it a sort of under tillage, they render it permeable to air and water. They even add to its quantity, for they feed upon it, and after extracting the greater part of the decaying vegetable matter which it may contain, reject the rest in the form of innumerable, "worm casts," which they leave on the surface, and with which everybody must be familiar.

Worms are often mentioned in the Bible, grubs and maggots, the larvæ of beetles and flies, being sometimes included under this

term. In Acts xii. 23, we read that Herod "was eaten of worms, and gave up the ghost:" the worms which in this case attacked Herod alive, and killed him, must have been entozoa, or intestinal worms. When the manna was kept until the morning, we are told (Exod. xvi. 20) that it "bred worms, and stank:" these worms were probably some kind of larvæ. The word worm also sometimes in the Bible refers to lowliness of condition, and is therefore used metaphorically; as Isa. xli. 14, "Fear not, thou worm Jacob," and Ps. xxii. 6, "I am a worm, and no man." In Isa. li. 8, worm means the larva of the clothes-moth (*Tinea*), standing for a Hebrew word which is used in this place only. In Micah vii. 17, "They shall move out of their holes like worms of the earth;" (margin, "creeping things,") the word used rather signifies serpents than worms.



Lumbricus Terrestris,
or Earth-worm.

a, Minute apertures on either side leading to small respiratory sacs; *b*, anterior segments magnified, showing the bristles directed backwards; *c*, egg enclosing two young; *d*, escape of young worm from the egg.

For, to say nothing of half the birds and some quadrupeds which are almost entirely supported by them, worms seem to be the great promoters of vegetation, which would proceed but lamely without them, by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves and twigs into it, and, most of all, by throwing up such infinite numbers of lumps of earth, called worm-casts, which being their excrement is a fine manure for grain and grass."

CHAPTER III.

CLASSES III AND IV.—RADIATA AND PROTOZOA.

3. THE CLASS RADIATA, OR RADIATED ANIMALS.

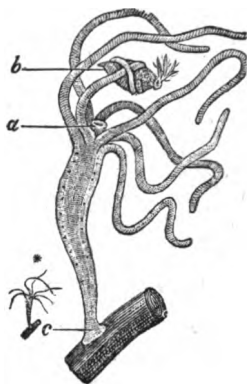


OF the three orders into which naturalists have divided this class, the last is the only one which is referred to in the Bible, or the

Order Zoophyta or Polypti, animals having a fleshy cylindrical hollow body, the mouth of which is surrounded by numerous arms or tentaculæ, and commonly fixed by one end. Example, Hydra or fresh-water polyp and the marine or compound coral polypts. In this, one of the lowest orders in the animal creation, the animal and plant approach one another so closely, that it is hardly possible to draw any line of demarcation between them. These creatures, which show undoubted signs of animality, present also many striking indications of a vegetable nature. They are not only fixed to the ground like plants, but they have also a plant-like method of growing and propagating. Hence their name in science zoophyta (Gr. *zoon*, an animal, and *phyton*, a plant).

It is extremely difficult to convey to the reader an accurate practical idea of a zoophyte. He must first make the acquaintance of the fresh-water polyp (*Hydra*), which is common throughout the summer months in ponds or slowly running streams, attaching itself usually to the under surface of the leaves of aquatic plants or to any substance floating in the water. Collect some of the water and its vegetation in a glass vessel, and after the water has stood

in some quiet place for a few hours, and the agitation has subsided, the Hydras will have adhered to the side of the vessel, and can be easily seen with the eye, and be removed with a drop tube, if necessary, for microscopic observation. The organization of the Hydra is very simple. It is only a digestive cavity, or stomach, which is surrounded at the mouth by a number of tentacula, or feelers, by means of which the animal seizes its prey generally some minute insect or worm, transferring it instantly to its stomach, and devouring it much after the same style as a snake devours any small quadruped.

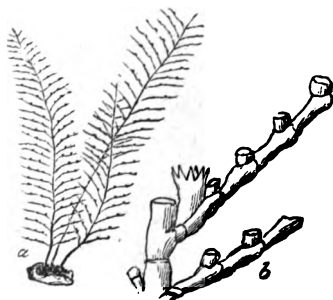


Hydra, or polype, attached to a piece of stick, with its arms extended in quest of prey. *a*. The mouth of the animal, surrounded by the tentacula. *b*. The tendril-like grasp of an aquatic insect. *c*. Foot or base of the animal, with its suckorial disc. The figure shows also the natural size of the animal.

The marine Hydra is very similar in structure to that found in fresh-water streams or ponds, with this difference, that it is usually associated with other Hydras, forming what is called a polypidom. The different species of *Sertularia*, *Flustra*, and *Corallina*, found intermingled with the seaweed cast upon our shores, and usually regarded as seaweed, are in reality zoophytes, constructed by an association of marine polypes; and just as the leaves of a tree take in food from the air, sufficient for their own nutrition, and also for

the nourishment and growth of the tree which is reared by their united labours, so the individual polypes take in food from the water, which they apply, first, to their own support, and afterwards to that of these plant-like structures which they conjointly build.

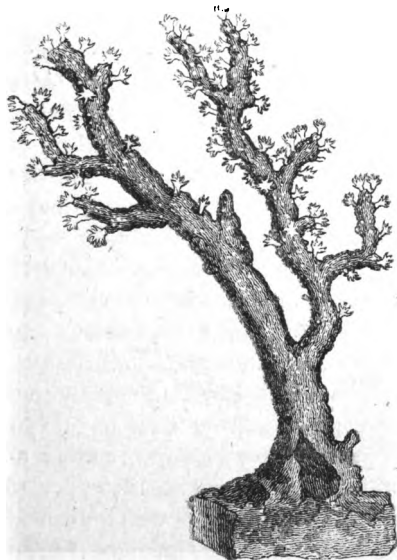
It is interesting to trace the analogies between the members of the animal and vegetable kingdom in the lower orders of animated nature. The sertularian polypes, with their common stalk bearing numerous individuals, have in every instance been produced by continuous growth from a single individual. Here we have a repetition of similar parts precisely as in plants. There can be no mistake as to the vegetative nature of these actions. Each of



a, Sertularia, or compound polype. *b*, Magnified view of a portion of its branches, showing the polype buds.

these associated polypes has an independent vitality of its own, and yet all depends on the general life diffused through the entire community. They individually capture and digest their prey like the Hydra, and yet the products of their individual digestion are applied, not only to their own support, but to that of the general axis; for the stomachs of the several polypes communicate with each other by means of a tube which proceeds from the base of each into the common digestive cavity of the stem. Some of these polype buds periodically die, and are cast off like the leaves of a tree; whilst others, retaining their vitality, spontaneously detach themselves, and evolve into similar fabrics elsewhere.

THE RED CORAL (*Corallium rubrum*, L.). This is a marine production formed by numerous polypes organically united with each other and covering the coral itself with one continuous living membrane. The annexed figure shows the mode in which the polypes live together and open on its surface in star-like figures. It is these polypes which give the peculiar markings to the surface. The coral produced is a branched tree-like structure, beautifully



The Red Coral.

red and very hard, and for this reason much sought after for ornamental purposes. Of course, in the preparation of coral for the market, the fleshy mass is removed from its surface. Coral is abundant in the Red Sea, Persian Gulf, and in various parts of the Mediterranean. Very fine coral is found between Tunis and Algiers, off the coast of Barbary, where the French and Italians carry on the coral fisheries.

"Coral always grows perpendicularly on the surface of the rock to which it attaches itself, in whatever position the rock may be placed. Coral requires from eight to ten years to arrive at its full growth, which is from eight to twelve inches in height. It is dredged up from depths varying from 10 to 1100 fathoms. Its value depends on its size, solidity, and the depth and brilliancy of its colour. Some of the corals in the market are worth from eight to ten guineas an ounce, whilst other kinds will not fetch one shilling a pound.

"Stone corals, under the name of brainstones, millepores, madrepores, harp corals, and cup corals, are well-known drawing-room and mantel-piece ornaments. When living, they were covered with fleshy matter, from which projected the polypes which gave the peculiar markings to their surface. The fleshy mass was removed, and the coral was then bleached, and obtained its beautiful white colour by exposure to the air and sun. These corals occur in prodigious quantities in the South Pacific Ocean, where they form the reefs and islands so abundant there."*

The coral-building polypes of the tropical seas are the greatest wonders in the creation. Islands and coral reefs abound in the Pacific Ocean, which owe their elevation entirely to the labours of myriads of successive generations of these minute and apparently feeble and contemptible marine Hydras, and in the geological periods of the world's history they appear to have played a most important part. Few things in nature perhaps can give us a more vivid perception of the power of the Omnipotent Creator than coral reefs and islands, when we take into consideration their extent and the agents employed in their erection. These reefs stretch sometimes for hundreds and even thousands of miles, and they are formed, not in tranquil seas, but in the midst of an ocean, where the long swell caused by the steady action of the trade winds never ceases, and whose waves therefore are much heavier than those of temperate climates. These waves are ever breaking on the reef of rocks which the coral polypes are engaged in rearing. But in

* The Natural History of Commerce, by John Yeats, LL.D.

countless millions these humble zoophytes are working on at the command of "Him" whom the "winds and waves obey," and whilst the works of man, his light-houses and landmarks, and even the rocks of granite and porphyry, yield slowly in the course of ages to the wear and waste of the waves, it is not thus with the works of these humblest of God's creatures; for the coral reef continues to grow until an island is formed, at first covered by marine vegetation, afterwards by land and fresh-water plants. Cocoa-nuts drifted to the newly formed coral islet by the currents of the ocean, and cast upon its shores by the waves, speedily germinate; and these beautiful tropical palms having established themselves, birds soon come in search of food, bringing with them the seeds of other plants, whilst every high tide and gale adds some new treasure to the store of natural wealth, until at length that once barren coral reef is converted into an island exuberant with fertility and life. Lastly, man appears upon the scene, coming to take possession of all these riches which a kind Providence has been accumulating there for him in the course of ages.

Coral is distinctly mentioned twice in the Bible, and in both instances in the Old Testament. It is enumerated among the precious things with which wisdom, which is priceless in value, cannot be bought. (Job xxviii. 18,) "No mention shall be made of coral, or of pearls; for the price of wisdom is above rubies." Coral is also mentioned as an article of merchandize in the lamentation of Ezekiel over Tyrus (Ezek. xxvii. 16), "Syria was thy merchant by reason of the multitude of the wares of thy making: they occupied in thy fairs with emeralds, purple, and brodered work, and fine linen, and coral, and agate."

4. THE CLASS PROTOZOA, OR FIRST ANIMALS.

The Protozoa, or first animals, correspond to the Protophyta, or first plants, and are the simplest known animal organisms with which naturalists are acquainted. Both abound in stagnant water, and are also invariably found together in foetid water in which

flowers have been kept too long, when examined with the microscope. They have been divided into three orders, viz. :—

1. THE RHIZOPODA (Gr. *rhiza*, a root, and *podes*, feet), of which the *Amœba diffuens* (Gr. *amoibos*, changing, and Lat. *diffuens*, flowing every way), an animal even simpler in its organization than the *Hydra*, and which is constantly changing its form, is the type. It is a gelatinous sac or cavity, possessing neither mouth nor intestinal canal, whose only organs of locomotion are mere root-like processes called pseudopodia, or false feet. Food passes through the sarcode walls (Gr. *sarcos*, flesh) of the bodies of these animals, without interrupting the continuity of their surface any more than a plum the surface of a pot of treacle when dropped into it.

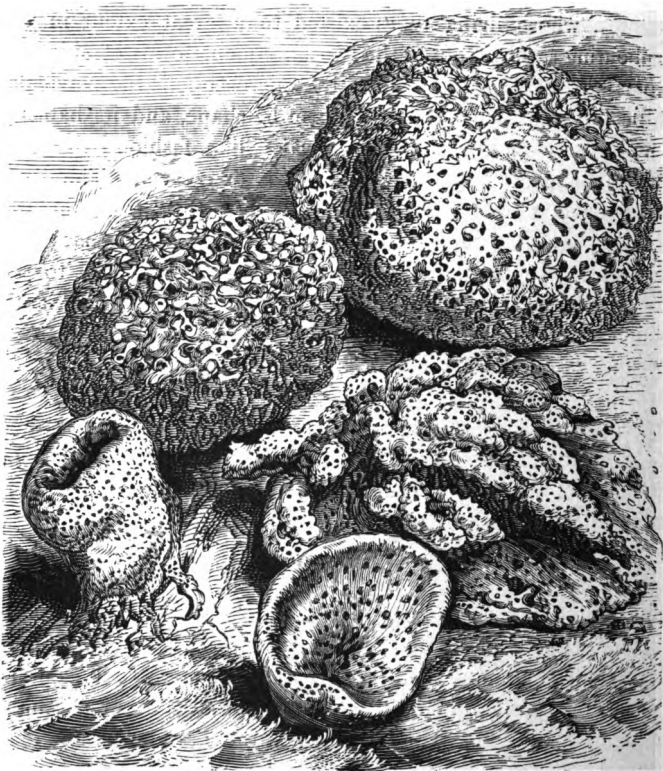
The foraminifera of the chalk are a group of minute many-chambered shells enclosing rhizopoda. These shells are pierced like a sieve for the protrusion of their delicate rhizopodous filaments. They occur in rocks of all formations, from the Silurian upwards, but especially in the chalk. A cubic inch of chalk was estimated to contain a million of these animalcules, and flint is known to consist almost entirely of their minute siliceous shells, which are all but indestructible. Indeed, the most surprising part of the natural history of foraminiferous shells is not so much their exquisite natural sculpturing and the pores with which they are marked, as their preservation as fossils. We refer especially to the group of Protozoa known as the Diatomaceæ, so called in allusion to their powers of propagation by self-division of the body into two or more parts. Whole mountains and ranges of hills in different parts of the world are composed entirely of the siliceous shells of these Infusoria. Chalk consists almost entirely of infusorial shells, which may be detected with the microscope in the smallest portion of it taken up on the point of a knife. Ehrenberg found that a hill in Bohemia, composed chiefly of the polishing substance known in the arts as "tripoli," was one mass of the flinty shells of these creatures, and that in a stratum or bed, fourteen feet in thickness, a cubic inch contained the remains of 41,000,000,000 of individuals. Professor Rogers discovered that

the towns of Richmond and Petersburg, in Virginia, are built on beds composed of the shells of marine Infusoria. He mixed a few grains of the earth with water, placed a single drop on a glass slide, and on examining the stain left on the slide by its evaporation, found it to consist almost entirely of curious infusorial structures, whose living types existed to a great extent in the neighbouring seas. One of the most frequent forms of siliceous diatoms which float in the field of the microscope is the *Navicula*, or little boat animacule, so called from its shape, and its habit of swimming through the water in a canoe-like fashion; this was found to be most abundant in the Richmond earth. The Rev. Dr. Buckland, a clergyman of the Church of England, and, greatly to his honour, an authority amongst geologists, says that "the remains of these minute animals have added much more to the materials of the crust of the earth than the bones of elephants, hippopotami, and whales."

2. THE PORIFERA, OR SPONGES (Lat. *porus*, a pore, and *fero*, I bear).

When in the water and in the living state, sponges are covered with a gelatinous coating of creatures like the *Amœba*, which form in fact its horny, fibrous, porous skeleton. This living gelatinous matter, which resembles the white of an egg, is spread all over the fibres of the sponge, and runs away freely from it when the sponge is taken out of the water. Nothing then remains visible but the sponge itself, which is in fact the horny structure or skeleton formed by the labours of the animals constituting the gelatinous coating. Now if the reader will examine a piece of sponge, he will see on its surface an indefinite number of minute holes, amongst which there are larger openings scattered. When alive and in the water, currents of water are seen to enter the smaller openings, which, after passing through the body of the sponge, are ejected out of the larger orifices. Nutritive matter is conveyed by these currents into the body of the sponge, and matter which has yielded up its nutrition, or fæcal matter, is at the same time removed.

Dr. Grant, who first observed this interesting phenomenon, thus describes it: "Having put a small branch of sponge with some sea-water into a watch-glass, in order to examine it with the microscope, on bringing one of the openings on the side of the



Varieties of Marine Sponge.

sponge fully into view, I beheld for the first time the spectacle of this living fountain vomiting forth from a circular cavity an impetuous torrent of liquid matter, and hurling along in rapid succession opaque masses, which it strewed everywhere around.

The beauty and novelty of such a scene in the animal kingdom long arrested my attention ; but after twenty-five minutes of constant observation, I was obliged to withdraw my eye, from fatigue, without having seen the torrent for one instant change its direction, or diminish in the slightest degree the rapidity of its course. I continued to watch the same opening at short intervals for five hours, sometimes observing it for a quarter of an hour at a time, but still the stream rolled on with a constant and equal velocity."

Subsequent observations have proved that the living sponge has the power of opening and closing at pleasure its orifices, which are capable of acting independently of each other ; thus fully establishing the animal nature of these simple creatures.

Sponges occur in all seas from the equator to the poles, but they attain their greatest size and perfection in the tropics. They grow on anything which will serve them as a point of attachment, covering rocks, shells, seaweed, and even living animals. They differ also very much in their mode of growth, and seem to revel in almost every variety of form, especially in warm climates, where the water—"deeply, darkly, beautifully blue"—is never disturbed by storms. Here are found sponges known by the name of "Neptune's drinking cups," from their vase-like appearance: some look like fans, others globes, and others like the intertwined branches of a shrub. But very few species are useful to man. Several kinds are in the market, but those most in demand are the Turkey sponges from the Mediterranean, and the West India variety. The coast of Syria also furnishes the finest and best toilette sponges, whilst an inferior sponge with a large-holed texture, called horse-sponge, comes from the coasts of Barbary, Tunis, and Algiers. The property which sponge possesses, of absorbing water into its structure, and retaining it until squeezed out, renders it so valuable for all purposes involving washing and cleansing.

The class Protozoa also includes—

3. THE INFUSORIA, OR PROTOZOA, which appear in vegetable infusions, to which the attention of those possessing a microscope is

especially directed, which, next to the telescope, is the most valuable instrument ever bestowed by art on the investigator of nature. Infusorial animalcules abound in stagnant water, and are easily procured by keeping plants in water until the water becomes foetid ; then a single drop examined with the microscope will show them. These animalcules are usually furnished with a mouth, digestive apparatus, and cilia, by means of which they create currents of water in their immediate vicinity, and thus draw their prey into their stomach, and also move rapidly in all directions through the water. In the great work of Dr. Ehrenberg, a splendid volume, folio size, containing sixty-four plates filled with several hundred infusorial forms drawn and coloured from nature, the variety of form assumed by these animalcules is well represented. Some resemble globes, trumpets, stars, bells, cups, necklaces, and fans. The minuteness of the Infusoria, and their astonishing abundance, are no less surprising than their variety of form. The Monad, the smallest of them, must be magnified linearly three hundred times to be seen at all, and five hundred times if we wish to observe it accurately. In a single drop of water five hundred millions of monads have been computed to exist. They appear as transparent, globular, or oval bodies, of a red, green, or yellow hue, and in such countless numbers as even to colour the element in which they live. The phosphorescence of the ocean is produced by the myriad forms of the Infusoria in the water. Ehrenberg ascertained that even the ice and snow of the polar sea, as well as the clearest and purest ocean-water in all climates, taken thousands of miles away from land, is crowded with microscopic life. We need not therefore wonder at their diversity of structure, as they are so widely diffused.

Amongst the many interesting forms of the Infusoria may be named the Rotifera, or wheel animalcules, which under the microscope seem like wheels in rapid motion. The parts do not in reality move, but only seem to do so, owing to the rapid movements of the cilia or delicate hair-like organs with which the mouth of the animalcule is fringed. The Rotifera have only

one stomach, and their cilia are confined to its mouth. The Vorticella, or bell animalcules, are easily recognized by the long flexible stalk on which they are placed, through the entire length of which runs a long muscular thread. So long as the cilia are in action the Vorticella stretches its stalk to the utmost capacity, but on the least alarm the cilia vanish, and the stalk shrinks suddenly into a little spiral coil.

The Infusoria are amazingly productive, surpassing in fertility every other living organism with which naturalists are acquainted, so that their astonishing abundance is easily accounted for. They multiply—1. By gemmation or budding, the young appearing first as buds on the body of the parent, growing into the form peculiar to the species, then dropping off, and becoming independent and distinct animals. 2. By self-division of the body, each part becoming a separate animal. 3. From ova or eggs. They do this when the ditches or pools in which they live dry up in summer. These fertile germs are lifted up by the winds, and float in the air everywhere, ready to burst into life when again placed in favourable circumstances.

But all this care bestowed on creatures so minute and apparently insignificant is not without its object, and accordingly we find that the Infusoria are the humble instruments in the hands of Providence in effecting most important physical changes on the surface of the globe, and at the same time they are of great benefit to man. They are the invisible scavengers which clear the stagnant waters of their decaying matters, removing them as they become offensive to our senses and dangerous to human life. By feeding on them they become a part of their organization, and they in their turn become food for fishes, which contribute to the sustenance of man himself. But the most surprising part of their natural history is their abundant preservation as fossils, of which we have already spoken.

The following mode of obtaining these minute creatures is recommended by the Rev. J. Wood, and is quoted from his little shilling volume, already recommended: "Get a small, rather

wide-mouthed phial, and with the piece of string which every sensible man always has in his pocket, lash the bottle by the neck across the end of a walking-stick. Look out for the best hunting-grounds in ponds, rivulets, etc. ; push the inverted bottle among the flocculent greenage or decaying leaves, and after pushing it well about, turn it suddenly over, when the water will rush rapidly in, carrying with it myriads of forms of minute organisms. The bottle should always be labelled with the particular place, pond, or stream whence the water was obtained."

Thus the microscope makes interesting even an accumulation of scum collected from the surface of a stagnant pool by the roadside, making us forget everything that is repulsive in its appearance or offensive in its smell. It becomes to the microscopist a never-failing treasury of science, every drop teeming with forms of life and beauty.

Of these three orders of the class Protozoa, or first animals, the Scriptures refer only to the order Porifera, or sponges.

THE COMMON SPONGE (*spongia officinalis*).

Our readers will recollect the solemn and affecting occurrences at the crucifixion, and the presentation of the sponge to their thirsting, dying Saviour. (Matt. xxvii. 48,) " And straightway one of them ran and took a sponge, and filled it with vinegar, and put it on a reed, and gave Him to drink."

FINIS.

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